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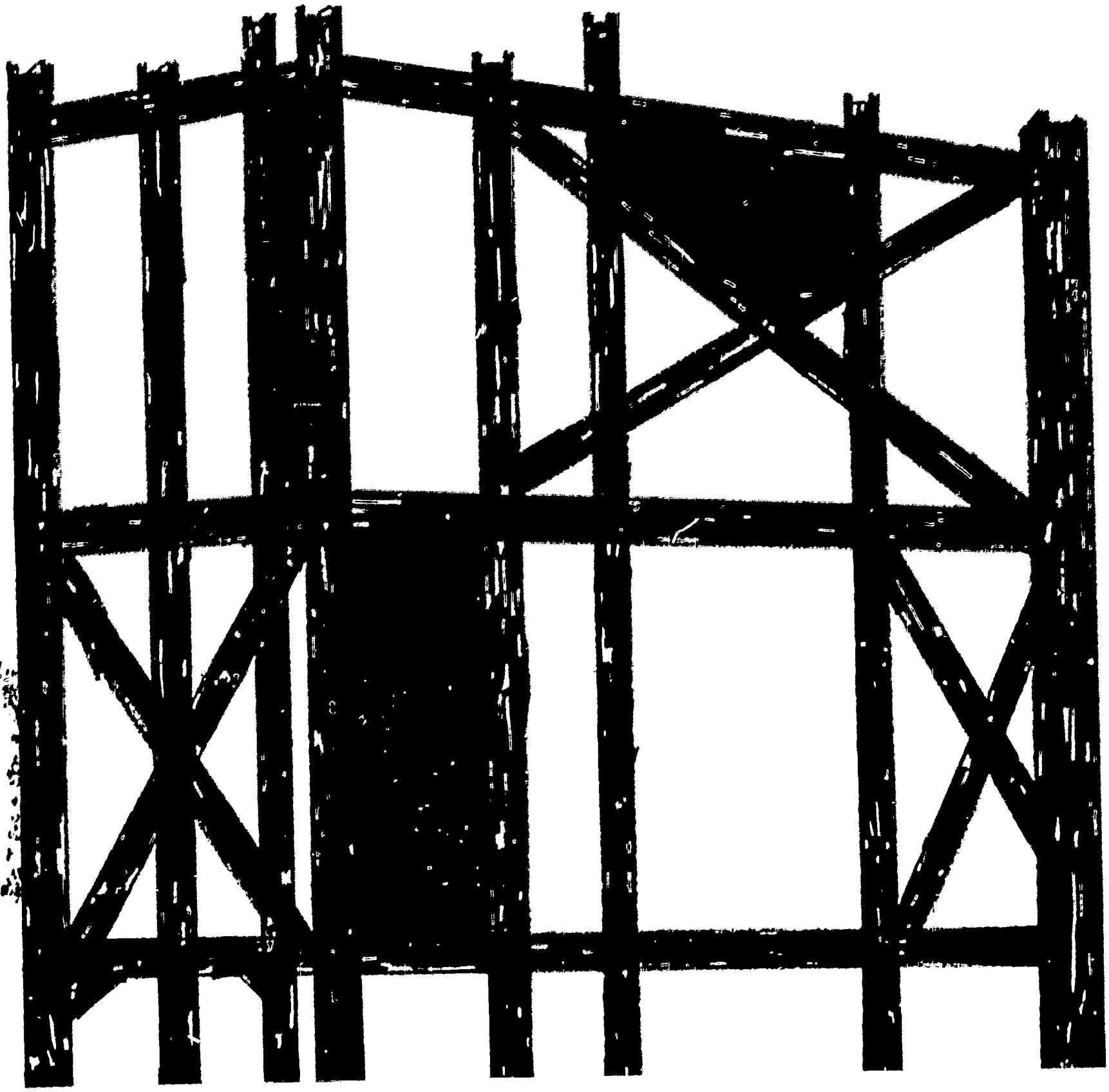
The major purpose of this guide is to elicit the information needed for the writing of educational specifications used in the planning of educational facilities for automotive servicing programs. It is for use by instructors, supervisors, school plant planners, and local school officials. Part I is a discussion of the major purpose , the underlying assumptions, the guiding principles, and the recent trends which were utilized in the preparation of the guide. Part II provides data collection instruments covering basic program features, objectives, and the kinds of programs organized to implement the objectives. Part III contains data collection instruments covering facts relative to the actual desired space. Part IV is an annotated bibliography of 24 related items published between 1959 and 1968. Fifteen data collection instruments are included. A related document is "A Guide to Systematic Planning for Vocational and Technical Schools" (VT 007 825). (EM)

THE CENTER FOR VOCATIONAL AND TECHNICAL EDUCATION

THE OHIO STATE UNIVERSITY
1900 Kenny Rd., Columbus, Ohio, 43210



# A GUIDE FOR PLANNING FACILITIES FOR OCCUPATIONAL PREPARATION PROGRAMS in AUTOMOTIVE SERVICE



The Center for Vocational and Technical Education has been established as an independent unit on The Ohio State University campus with a grant from the Division of Comprehensive and Vocational Education Research, U. S. Office of Education. It serves a catalytic role in establishing consortia to focus on relevant problems in vocational and technical education. The Center is comprehensive in its commitment and responsibility, multidisciplinary in its approach, and interinstitutional in its program.

The major objectives of The Center follow:

1. To provide continuing reappraisal of the role and function of vocational and technical education in our democratic society;

2. To stimulate and strengthen state, regional, and national programs of applied research and development directed toward the solution of pressing problems in vocational and technical education;

3. To encourage the development of research to improve vocational and technical education in institutions of higher education and other appropriate settings;

4. To conduct research studies directed toward the development of new knowledge and new applications of existing knowledge in vocational and technical education;

5. To upgrade vocational education leadership (state supervisors, teacher educators, research specialists, and others) through an advanced study and inservice education program;

6. To provide a national information retrieval, storage, and dissemination system for vocational and technical education linked with the Educational Resources Information Center located in the U. S. Office of Education.

RESEARCH 29

INTERIM REPORT
GRANT NO. OEG-3-7-000158-2037

# A GUIDE FOR PLANNING FACILITIES FOR OCCUPATIONAL PREPARATION PROGRAMS IN AUTOMOTIVE SERVICE

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APRIL 1969

# FOREWORD

One of the most fundamental concerns in planning for vocational and technical education facilities is that of assuring that educational requirements dictate the nature of the facilities. Other concerns include planning a sufficiently adaptable and flexible structure to permit needed modifications and programmatic changes over the lifetime of the building. Experiences have shown that adequate manuals and guide materials can provide substantial assistance in planning educational facilities. This document is a guide for planning facilities for occupational preparation programs in automotive services. The information recorded in the guide is to be used in the preparation of educational specifications.

The guide lists a series of pivotal questions about the educational program to be offered. The answers to these program questions bear directly on the numbers and kinds of instructional areas needed in the contemplated facilities. After program decisions are recorded, the guide provides for the description of instructional areas needed to meet program requirements. Much of the material is presented in a checklist format which allows for consideration of alternatives in facility planning.

The guide was designed for use by any person or groups of persons responsible for planning automotive service training facilities. It is anticipated that knowledgeable persons such as automotive service instructors, state supervisors, university school plant planners, and local administrators will find the guide a useful planning tool. The guide can also be used for instructional purposes at universities, colleges, seminars, and institutes.

This guide is the seventh in a series being developed by The Center. Subsequent guides will be published for dental technology, electrical technology, and medical technology. The first six guides developed were in the fields of home economics, machine trades, data processing, business and office occupations, animal science technology, and metallurgy technology. All guides follow the general format developed by The Center project staff and M. J. Conrad, head, Administration and Facilities Unit, College of Education, The Ohio State University. Vocational educators should also refer to the basic guide, A Guide to Systematic Planning for Vocational and Technical Education Facilities.

The Center for Vocational and Technical Education, The Ohio State University, worked cooperatively with Jon P. Adams, dean, Technical-Vocational Instruction, Schoolcraft College, Livonia, Michigan in preparing this planning guide. Center project staff members were Richard F. Meckley, Ivan E. Valentine, and Zane McCoy.

The Center is grateful to the many individuals and groups whose assistance and suggestions led to the successful conclusion of the project. Special appreciation is due Samuel D. Morgan, Richmond Technical Institute, Rockingham, North Carolina, and Lowell A. Welsh, director, Nebraska Vocational Technical School, Milford, Nebraska for their thoughtful and helpful review of the initial draft of the guide.

Robert E. Taylor, Director
The Center for Vocational
and Technical Education

# CONTENTS

# A GUIDE FOR PLANNING FACILITIES FOR OCCUPATIONAL PREPARATION PROGRAMS IN AUTOMOTIVE SERVICE

# PART I

## INTRODUCTION

### PURPOSE OF GUIDE

The major purpose of this guide is to elicit the necessary information for the writing of educational specifications for facilities to house needed programs in automotive service.

In addition to the major purpose of providing important and comprehensive information to be incorporated in educational specifications, the guide is also designed to:

- Assist planners in the formation of creative solutions to the housing of desired educational programs.
- Prevent important considerations from being overlooked in the facility planning process.
- Encourage logical and systematic facility planning.

### ORGANIZATION OF GUIDE

The facility planning guide is organized under four major headings or parts. Part I (Introduction) is a discussion of the major purpose, the underlying assumptions, recent instructional trends, and the guiding principles which were utilized in the preparation of the guide.

In Part II (The Instructional Program) important information is sought on automotive service basic program features, objectives, and the kinds of programs which will be organized to implement them.

In Part III (Distinct Types of Instructional Areas to be Provided) the actual spaces desired to house the programs are described in detail.

Part IV is an annotated bibliography of reference sources which offer a more detailed treatment of the various phases of facility planning.

## UNDERLYING ASSUMPTIONS

Important assumptions were made in the preparation of this guide. They were:

- Major educational program decisions have or are being made. Content of instruction has been determined through educational surveys, advisory committees, school board study, etc. Instructional methods have been determined by qualified automotive service and other appropriate staff members. To assure adequate educational program planning, the guide will ask important questions which may serve as guidelines to such planning.

- A cooperative and collaborative relationship has been established with knowledgeable local agencies who are aware of economic, political, and social conditions which must be taken into account in short- and long-range educational planning.

- Educational, economic, political, and social planning has revealed the approximate numbers and kinds of students (school-age and adult) to be served by the proposed school. Such information has been provided by enrollment projections, census tract data, student interest studies, etc.

- The information recorded in this document will be used in the preparation of educational specifications for use by an architect(s) in facility design.

- Sufficient funds are or can be made available to support both the provision of facilities and the operation of the desired occupational preparation programs.

## RECENT INSTRUCTIONAL TRENDS

- Expanded programs to reach not only the average and those who are college bound, but also the unusually gifted, the physically handicapped, the mentally retarded, and the culturally disadvantaged are needed and being provided by occupational preparation programs.

- Cooperation among instructors in developing interdisciplinary units or courses is increasing. Cooperative instruction is encouraged and facilitated by the proximity of instructional and work areas where the teachers can plan together and produce instructional materials.

- Mobile equipment and convenient space for storing it is making the same space available for many purposes and resulting in more effective and efficient use of space.

- Mechanical and electronic teaching aids are being utilized to a greater degree by instructors in occupational

preparation programs. To some extent, the effective use of such devices depends upon the accessibility and convenience of storage.

## GUIDING PRINCIPLES

In planning facilities to house occupational preparation programs, it is suggested that educational program and facility decisions be consistent with the following guiding principles.

- The educational program is the basis for planning space and facilities.

  Space and facilities should accomodate changes in the educational program.

- The program must serve the needs of a variety of groups in the community.

- Space and facilities for the program can be extended through the use of community resources.

- Safe and healthful housing must be provided for all students.

- Space and facilities for occupational preparation programs should be considered in context with the total educational program of the institution and the community.

# PART II

## THE INSTRUCTIONAL PROGRAM

Part II of the guide records important instructional program decisions with respect to basic program features, objectives, and needed information on occupational preparation programs to be housed.

### BASIC PROGRAM FEATURES

Basic features of the educational program are determined greatly by a school or department's educational philosophy. A philosophy of education provides a base from which program objectives and teaching and learning activities designed to meet these objectives can be derived. In the final analysis, it is the kinds of teaching and learning activities to be carried on which should determine facility needs.

In this section, planners have an opportunity to express basic program features which will serve as guidelines for the planned occupational preparation programs in automotive service.

Indicate below the relative degree of emphasis to be placed on each of the program features stated by circling the appropriate number. The scale provided for this purpose ranges from 1 for major emphasis, 2 for some emphasis, 3 for slight emphasis, to N for no emphasis. This same scale will be used frequently throughout the planning guide.

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. Purpose of program

   a. The purpose of the program will be to orient the student or trainee to the following levels of automotive service:
      1) Automotive service specialist (for the gas and oil industry) 1 2 3 N

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

2) Auto mechanic 1 2 3 N
3) Service technician (diagnostician) 1 2 3 N
4) Service management 1 2 3 N

b. To give students background which provides for:
1) Shop safety 1 2 3 N
2) Shop organization 1 2 3 N
3) Application of technical information 1 2 3 N
4) Ability to analyze each job 1 2 3 N

c. To prepare trainees for gainful employment in one of the levels of automotive service mentioned under (a) above 1 2 3 N

d. To give the student the background and training needed for him to continue his education beyond this program and to know the kinds of training available and sources of information needed to keep abreast of industry changes 1 2 3 N

e. To provide leadership training to enable trainees to move into higher echelons of service (i.e. management) 1 2 3 N

f. Other program purposes which should be included are:
1) _____
2) _____
3) _____
4) _____

2. Students

a. Student admission to the program is on the basis of selective criteria which include:
1) _____
2) _____
3) _____
4) _____

b. The program will place emphasis on skill acquisition. 1 2 3 N

c. The program will place emphasis on the learning of theory. 1 2 3 N

d. Students will have freedom of movement and access to learning materials. 1 2 3 N

e. Students will be encouraged to act independently. 1 2 3 N

f. Students will be provided with cooperative work experience outside the school. 1 2 3 N

g. Other basic program features relating to students which should be included are:
1) _____
2) _____
3) _____
4) _____

3. Instruction

a. The instructional approach will be single discipline (automative service) as opposed to inter-disciplinary (automative service, science, etc.). If not a single discipline approach, describe the inter-disciplinary approach and the disciplines involved

_____
_____
_____
_____

Yes No

b. Cooperative or team instruction will be used. If this mode of instruction is to be extensively emphasized, describe in general terms. _____
_____
_____
_____

Yes No

c. Community resources will be utilized in instruction. If a high emphasis is to be placed on use of community resources, describe some of these resources.

_____
_____
_____
_____

Yes No

d. Instructional flexibility is required. If a high emphasis is to be placed on instructional flexibility, please describe the kinds of flexibility desired _____
_____
_____
_____
_____

Yes No

4. Other basic program features important to the planned instructional program:

a. _____
_____
b. _____
_____
c. _____
_____
d. _____
_____

## EDUCATIONAL OBJECTIVES

Educational objectives are often identified as goals or outcomes of the educational program. An objective should describe a desired educational outcome that is consistent with a school's philosophy.

Objectives are important to both the planner and the architect since they determine the school's program and related activities. They provide important implications which when translated into facilities can both enhance as well as adequately house the desired program. Thus it becomes imperative to clearly establish the program objectives prior to embarking on educational specifications and subsequent building design.

The purpose of this part of the guide is to bring together these elements in a way to provide direction and understanding for both the planner and the architect. Space is provided below to indicate degree of emphasis by circling the appropriate number for each of the objectives, and to list additional objectives. The scale provided for this stated purpose ranges from 1 for major emphasis down to N for no emphasis.

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

| | | | | | |
|---|---|---|---|---|---|
| 1. | To prepare students for entry into gainful employment. | 1 | 2 | 3 | N |
| 2. | To motivate and recruit capable and qualified students to enroll in post-secondary school programs. | 1 | 2 | 3 | N |
| 3. | To permit students to retrain or return to continue training. | 1 | 2 | 3 | N |
| 4. | To provide pre-professional educational training for students who plan to enter colleges and universities. | 1 | 2 | 3 | N |
| 5. | To develop the ability and desire to work and live harmoniously together with mutual respect for the rights of others. | 1 | 2 | 3 | N |
| 6. | To develop in each student an understanding of the mechanical and scientific principals involved in the automobile. | 1 | 2 | 3 | N |
| 7. | To develop the ability to use and care for the basic automotive tools and specialized equipment used in the following areas: | | | | |
| | a. Engines | 1 | 2 | 3 | N |
| | b. Fuel systems | 1 | 2 | 3 | N |
| | c. Electrical systems | 1 | 2 | 3 | N |
| | d. Suspension systems | 1 | 2 | 3 | N |
| | e. Brake systems | 1 | 2 | 3 | N |
| | f. Drive line and standard transmissions | 1 | 2 | 3 | N |
| | g. Transmission--automatic | 1 | 2 | 3 | N |
| | h. Accessory systems--such as power seats, brakes, etc. | 1 | 2 | 3 | N |

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

8. To develop sufficient skills and related technical knowledge of the trade to meet minimum entry requirements of the automotive industry. 1 2 3 N

9. To develop an understanding of logical step by step diagnostic procedure.

   a. Engine and components 1 2 3 N
   b. Steering and alignment 1 2 3 N
   c. Brakes 1 2 3 N
   d. Accessories 1 2 3 N

10. To develop good work habits of orderliness, cleanliness, and care of property.

   a. Engine rebuilding 1 2 3 N
   b. Drive line 1 2 3 N
   c. Steering 1 2 3 N
   d. Brakes 1 2 3 N
   e. Tool crib 1 2 3 N
   f. Parts department 1 2 3 N
   g. _____ 1 2 3 N

11. To develop safe work habits and to promote safety consciousness. 1 2 3 N

12. To motivate the student to aspire to higher levels--or to the highest of his ability. 1 2 3 N

13. Other program objectives include:

   a. _____
   b. _____
   c. _____
   d. _____

## PROGRAM CONTENT AREAS

Occupational preparation programs in automotive service or automotive technology should be designed to meet established objectives. All decisions made with respect to educational programs should be consistant with established philosophy and objectives.

Instruction in the automotive field can be provided on a number of levels. This could include the service specialist (see D.O.T. 7-81) a person trained in the areas of service usually performed in the gas and oil industry. The areas of service which may be performed in the well equipped service station include:

1. Wheel bearing and seal service
2. Cooling system service
3. Spark plug service
4. Exhaust system service
5. Battery service
6. Lighting circuit service
7. Automatic transmission--minor service
8. Tire service
9. Minor brake service
10. Lubrication and preventive maintenance procedures

In the post high school automotive service or the automotive technician program, major emphasis should be on the elements related to the performance of the automobile. These can be grouped into the following areas:

1. Engine and related performance areas--electrical and fuel
2. Alignment--steering and all related accessories which help keep the car on the road
3. Brakes and all related accessories which assist in stopping the automobile
4. Drive line and transmissions
5. Accessories--power units of all types, instruments, safety accessories

The content areas listed above are used in this planning guide because the facilities for each of these represent specialized areas and special equipment. In addition the supporting services in the academic areas are elements such as:

6. English, mathematics, government and speech

The following areas are directly related to the automotive field:

7. Air conditioning, physics, automotive accounting, management

Instruction in the vast field of automotive service may include career opportunities in the following areas: automotive mechanic, specialty mechanic, shop foreman, service writer, service salesman, service manager, parts manager, service station operator. It also includes career opportunities related to sales such as: jobber salesman, insurance and claims adjuster, automobile dealer.

This guide is designed to assist in the planning of facilities related only to preparation of programs leading to a career in automotive service.

In occupational preparation, the courses or units of instruction emphasize the students acquisition of knowledge, the development of understanding attitudes and skills relevent to occupational preparation, the utilization of specialized skills, and the application of applied scientific principles in the field of automotive service. Learning activities and experiences are organized to enable students to develop competencies essential for success in the automotive

service industry. In addition the opportunity should be provided for upgrading the skills of people who are presently engaged in this occupation.

Instruction in automotive service is usually presented in well defined subject areas. The subject areas of necessity at times may be grouped in clusters because of the relationship of components. An example is the relationship of steering components to the total front end and geometry.

In keeping with the modern trends of the automotive industry--which places the major emphasis on the factors concerning performance and de-emphasizes the heavy repair aspect such as engine rebuilding--the programs related to performance may be placed in five content areas related to performance and operation. These are: 1) engine and related performance areas--electrical and fuel; 2) alignment--steering and all related accessories which help keep the vehicle on the road; 3) brakes and all related accessories which help stop the vehicle; 4) drive line and transmissions--equipment used to transmit power from the engine to the drive wheels; 5) accessories--power units of all types (windows, seats, etc.,) instruments and safety accessories, as well as convenience items such as air conditioning.

The five content areas listed above related directly to the performance of the vehicle and will include most up to date occupational preparation related to SERVICE--service being defined previously as the functions of the vehicle related to 1) power; 2) control (keeping the vehicle on the road); 3) stopping; 4) transmission of power to wheels; 5) accessories (safety, convenience and power assisted).

The automotive service program should include: 1) the basic understanding of the automobile and all of its components; 2) the instruction directly related to the automotive area, i.e., air conditioning; 3) instruction in academic areas directly related to automotive service, i.e., applied physics; 4) academic instruction essential to the individual as well as the program, i.e., communication skills; and at least some exposure to general education, i.e., political science, basic accounting.

An example of a program designed to provide occupational competency in automotive service may include the following:

| Courses | Content Area |
|---|---|
| Communication Skills | Academic |
| Basic Electricity | Science |
| Physical Education | Physical Education |
| Front End Alignment | Alignment and Steering |

The concept of content areas is used in this planning guide because different instructional content areas usually call for different kinds of instructional facilities and equipment. The following content areas, which usually call for specialized instructional areas, are used in this guide.

- Engines--electrical and fuel
- Alignment and steering
- Brakes and power systems
- Drive line and transmissions
- Accessories and power units
- Academic supporting services (e.g., English, mathematics)
- Science--physics
- Physical education
- Others

## PLANNING INSTRUCTIONAL AREAS BY MODES OF LEARNING

The planning of instructional areas for occupational preparation facilities can be substantially aided through utilization of the concept of modes of learning. Learning can be divided into three distinct modes--reaction learning, interaction learning, and action learning.

Reaction learning, which usually occurs in an instructional area designed for lecture and demonstration, is characterized by activities which tend to be largely teacher-centered with the central focus on instruction. Student activities include listening, observing, and the taking of notes. Group size may vary from one to a very large number as the number of students has little effect on the learning experience if proper technological aids such as television, microphones, projectors and the like are used. Because student activities are relatively passive in reaction learning a short optimal type span is normally employed.

Lecture/demonstration areas can be used commonly for reaction learning in all subject areas. For example, in planning facilities for two diverse occupational preparation programs in automotive service such as front end alignment and brake service, the planner should bear in mind that reaction learning for students in both programs can occur in the same kind of instructional area. This means that facility planning should be done in terms of the total program rather than its fractional part. In many instances, lecture/demonstration areas can be shared not only by occupational preparation programs within vocational service areas, but also shared by distinct and dissimilar service areas, such as automotive service and highway technology. Where a great deal of facility sharing is planned, the planner should consider the optimal location within the total building and the advisability of clustering various instructional areas.

Interaction learning, which usually occurs in a seminar instructional area, is characterized by both teacher and learner activity participating as both listener and speaker. This mode of learning, of course, must occur in groups; however, sociological research suggests these groups should not exceed 15 persons for optimal effectiveness. Active interaction of all students generally requires a longer time span than reaction learning.

Seminar areas, like lecture/demonstration areas, are usually designed for common use by all vocational service areas. The same considerations which were outlined for lecture/demonstration areas also apply to seminar areas.

Action learning, which usually occurs in a laboratory instructional area, allows individual students to learn by doing. Students learn on an individual basis, but may, nevertheless, function in a group setting. Often in more flexible types of educational programs, students are scheduled for laboratory work on an individual basis. Since action learning involves overt action by individual students, the teacher's role is largely that of a consultant to the learner.

Laboratory areas, of necessity, are more specialized than lecture/demonstration areas used for reaction learning and seminar areas used for interaction learning. Since laboratory areas are designed to facilitate the learning of specific vocational and technical skills, there is less likelihood of sharing such areas by students in various vocational training programs. However, whenever common elements of skill instruction are found among vocational training programs, the sharing and clustering laboratory facilities can be both expedient and economical.

## SPECIALIZED AND MULTI-USE OF INSTRUCTIONAL AREAS

The relative amounts of time to be spent by students in a given vocational program in reaction, interaction, and action learning has definite implications for the number and kind of spaces to be provided. These time considerations combined with decisions on the degree of specialization versus multi-use help determine the nature of facilities required. Since most vocational programs have concentrated on action learning experiences, facilities designed for a particular vocational program have seldom provided adequate reaction and interaction facilities because of the limited utilization of such spaces. However, if the learning activities in any vocational program are broken down into the modes of learning, it will be noted that reaction and interaction spaces are the same regardless of the vocational area. Therefore, by providing common reaction and interaction spaces for all vocational programs, the most modern technological aids can be justified which, in most cases, will permit lectures, demonstrations and other group reaction learning experiences for groups larger than typically used in vocational education programs. Not only will group reaction learning be improved but more time will become available for the professional staff to work with individuals and small groups in interaction and action learning activities.

Scheduling group reaction and interaction learning experiences into specialized facilities permits complete flexibility in the use of action learning laboratories on an open individualized basis since students would no longer need to be scheduled into the action learning laboratories on a specific class basis. This will permit 100 percent room utilization of the action learning laboratories and also permit the introduction of differentiated staff assignments into vocational education.

The open laboratory concept also permits the planned sharing of certain specialized equipment which may be required by two or more vocational programs.

NOTE: THE FOLLOWING SECTIONS OF THE GUIDE (PAGES 17-37) WILL ASSIST THE PLANNER IN MAKING MATHEMATICAL DETERMINATIONS OF THE NUMBER OF INSTRUCTIONAL AREAS NEEDED TO HOUSE THE DESIRED PROGRAM. IF THE NUMBERS OF INSTRUCTIONAL AREAS REQUIRED ARE ALREADY KNOWN, THE PLANNER MAY NOW PROCEED TO FORM E, PAGE 39. IF, HOWEVER, MATHEMATICAL DETERMINATIONS ARE TO BE MADE, ALL FORMS SHOULD BE COMPLETED AS ACCURATELY AS POSSIBLE.

## OCCUPATIONAL PREPARATION PROGRAMS TO BE OFFERED

Information on each occupational preparation program to be offered is entered on a separate Form A which follows. Directions for completing Form A appear on pages 17-18. To assist planners, a sample completed Form A is given on page 19. Data entered in the sample Form A are for an automotive service program. The data were assumed for purpose of illustration.

Form A for each occupational preparation program should be filled out as completely as possible. However, it is realized, for example, that an automotive instructor completing Form A may be unaware of time allotments and methods of instruction in other subject areas. If such is the case, the instructor can only supply information on courses within the content areas of automotive service.

## INSTRUCTIONS FOR COMPLETING FORM A

## BASIC PROGRAM INFORMATION

Item 1
*Occupational Preparation Program*--Enter here the name of the occupational program to be offered.

Item 2
*Yearly Enrollment*--Enter here the projected maximum number of students to be enrolled yearly in the program.

Item 3
*Nature of Students*--Underline all categories which apply to the students to be enrolled in the program.

Item 4
*Weeks of Instruction per Year*--Enter here the number of weeks per year the school will be open for instruction, e.g., 36 weeks, 52 weeks.

Item 5
*Total Weekly Periods or Modules*--Enter here the total number of periods or modules (if modular scheduling is to be used) per week available for instructional purposes for each student. Do not count periods or modules scheduled for lunch or other non-instructional purposes.

Column 6
*Courses of Instruction*--List the courses or units of instruction to be offered either on a required or elective basis for the occupational preparation program.

Column 7
*Content Area*--Opposite each course of instruction, enter the appropriate content area as presented on page 11.

Column 8
*Total Course Enrollment*--Opposite each course of instruction, enter the projected maximum student enrollment.

Column 9
*Maximum Group Size for Reaction Learning*--Opposite each course or unit of instruction, enter the maximum group size in number of students for reaction (lecture/demonstration) type learning.

Column 10
*Estimated Weekly Periods or Modules of Reaction Level Learning*--Opposite each course or unit of instruction, enter the estimated number of periods or modules per week to be devoted to reaction learning per student.

Column 11
*Weekly Group-Periods or Modules (Lecture/Demonstration)*--To compute weekly group-periods or modules, divide the entry in Column 8 by the entry in Column 9 and round up to the nearest whole number. Then multiply the whole number by the entry in Column 10.

Column 12
*Maximum Group Size for Interaction Learning*--Opposite each course or unit of instruction, enter the maximum group size in number of students for interaction (seminar) type learning.

Column 13
*Estimated Weekly Periods or Modules or Interaction Level Learning*--Opposite each course or unit of instruction, enter the estimated number of periods or modules per week to be devoted to interaction learning per student.

Column 14
*Weekly Group-Periods or Modules (Seminar)*--To compute weekly group-periods or modules, divide the entry in Column 8 by the entry in Column 12 and round up to the nearest whole number. Then multiply the whole number by the entry in Column 13.

Column 15
*Maximum Group Size for Action Learning*--Opposite each course or unit of instruction, enter the maximum group size in number of students for action (laboratory) type learning.

Column 16
*Estimated Weekly Periods or Modules of Action Level Learning*--Opposite each course or unit of instruction, enter the estimated number of periods or modules per week to be devoted to action learning per student.

Column 17
*Weekly Group-Periods or Modules (Laboratory)*--To compute weekly group-periods or modules, divide the entry in Column 8 by the entry in Column 15 and round up to the nearest whole number. Then multiply the whole number by the entry in Column 16.

SAMPLE FORM A

BASIC PROGRAM INFORMATION

1. Occupational Preparation Program *Automotive Service*
2. Yearly Enrollment *80*
3. Nature of Students (underline appropriate categories): a. day school[1]; b. night school[1]; c. school age; d. adults; e. males; f. females; other (specify) *Day School*
4. Weeks of Instruction per Year *36*
5. Total Weekly Periods or Modules *30*

| Courses of Instruction | Content Areas | Total Course Enrollment | Maximum Group Sizes, Estimated Weekly Periods or Modules and Calculated Group-Modules or Period-Modules by Levels of Learning | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | REACTION* | | | INTERACTION** | | | ACTION*** | | |
| | | | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules |
| (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| *Automotive Engines* | *Engines, Electric & Fuel* | *40* | *40* | *3* | *3* | *15* | *2* | *6* | *15* | *5* | *15* |
| *Electrical Systems* | *Engines, Electric & Fuel* | *40* | *40* | *3* | *3* | *15* | *2* | *6* | *15* | *5* | *15* |
| *Fuel Systems* | *Engines, Electric & Fuel* | *40* | *40* | *3* | *3* | *15* | *2* | *6* | *15* | *5* | *15* |
| *Front End Alignment* | *Steering, Alignment* | *40* | *40* | *3* | *3* | *15* | *2* | *6* | *15* | *5* | *15* |
| *Brake and Brake Sys.* | *Brake and Power Sys* | *40* | *40* | *3* | *3* | *15* | *2* | *6* | *15* | *7* | *21* |
| *Communication Skills* | *Academic* | *40* | *30* | *3* | *6* | *15* | *2* | *6* | *0* | *0* | *0* |
| *Basic Electricity* | *Science* | *40* | *25* | *2* | *4* | *0* | *0* | *0* | *15* | *5* | *15* |
| *Government* | *Academic* | *40* | *25* | *1* | *2* | *15* | *2* | *6* | *0* | *0* | *0* |
| *Basic Math* | *Academic* | *40* | *25* | *2* | *4* | *0* | *0* | *0* | *0* | *0* | *0* |
| *Phys. Ed.* | *Phys. Ed.* | *40* | *30* | *1* | *2* | *15* | *1* | *3* | *25* | *2* | *4* |

[1]If both day and night schools are to be offered, fill out separate forms for each.
*(Lecture/demonstration); **(Seminar); ***(Laboratory)

FORM A

BASIC PROGRAM INFORMATION

1. Occupational Preparation Program _____

2. Yearly Enrollment _____

3. Nature of Students (underline appropriate categories): a. day school[1]; b. night school[1]; c. school age; d. adults; e. males; f. females; other (specify) _____

4. Weeks of Instruction per Year _____

5. Total Weekly Periods or Modules _____

| Courses of Instruction (6) | Content Areas (7) | Total Course Enrollment (8) | Maximum Group Sizes, Estimated Weekly Periods or Modules and Calculated Group-Modules or Period-Modules by Levels of Learning | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | REACTION* | | | INTERACTION** | | | ACTION*** | | |
| | | | Maximum Group Size (9) | Weekly Periods or Modules (10) | Weekly Group-Periods or Modules (11) | Maximum Group Size (12) | Weekly Periods or Modules (13) | Weekly Group-Periods or Modules (14) | Maximum Group Size (15) | Weekly Periods or Modules (16) | Weekly Group-Periods or Modules (17) |
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[1]If both day and night schools are to be offered, fill out separate forms for each.

*(Lecture/demonstration); **(Seminar); ***(Laboratory)

FORM A

FORM A

BASIC PROGRAM INFORMATION

1. Occupational Preparation Program _____

2. Yearly Enrollment _____

3. Nature of Students (underline appropriate categories): a. day school[1]; b. night school[1]; c. school age; d. adults; e. males; f. females; other (specify) _____

4. Weeks of Instruction per Year _____

5. Total Weekly Periods or Modules _____

| Courses of Instruction | Content Areas | Total Course Enrollment | Maximum Group Sizes, Estimated Weekly Periods or Modules and Calculated Group-Modules or Period-Modules by Levels of Learning | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | REACTION* | | | INTERACTION** | | | ACTION*** | | |
| | | | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules |
| (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
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[1]If both day and night schools are to be offered, fill out separate forms for each.
*(Lecture/demonstration); **(Seminar); ***(Laboratory)

FORM A

BASIC PROGRAM INFORMATION

1. Occupational Preparation Program _____
2. Yearly Enrollment _____
3. Nature of Students (underline appropriate categories): a. day school[1]; b. night school[1]; c. school age; d. adults; e. males; f. females; other (specify) _____
4. Weeks of Instruction per Year _____
5. Total Weekly Periods or Modules _____

| Courses of Instruction (6) | Content Areas (7) | Total Course Enrollment (8) | Maximum Group Sizes, Estimated Weekly Periods or Modules and Calculated Group-Modules or Period-Modules by Levels of Learning | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | REACTION* | | | INTERACTION** | | | ACTION*** | | |
| | | | Maximum Group Size (9) | Weekly Periods or Modules (10) | Weekly Group-Periods or Modules (11) | Maximum Group Size (12) | Weekly Periods or Modules (13) | Weekly Group-Periods or Modules (14) | Maximum Group Size (15) | Weekly Periods or Modules (16) | Weekly Group-Periods or Modules (17) |
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[1]If both day and night schools are to be offered, fill out separate forms for each.
*(Lecture/demonstration); **(Seminar); ***(Laboratory)

FORM A

FORM A

BASIC PROGRAM INFORMATION

1. Occupational Preparation Program _____

2. Yearly Enrollment _____

3. Nature of Students (underline appropriate categories): a. day school[1]; b. night school[1]; c. school age; d. adults; e. males; f. females; other (specify) _____

4. Weeks of Instruction per Year _____

5. Total Weekly Periods or Modules _____

| Courses of Instruction | Content Areas | Total Course Enrollment | Maximum Group Sizes, Estimated Weekly Periods or Modules and Calculated Group-Modules or Period-Modules by Levels of Learning | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | REACTION* | | | INTERACTION** | | | ACTION*** | | |
| | | | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules | Maximum Group Size | Weekly Periods or Modules | Weekly Group-Periods or Modules |
| (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| | | | | | | | | | | | |
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[1]If both day and night schools are to be offered, fill out separate forms for each.

*(Lecture/demonstration); **(Seminar); ***(Laboratory)

# PART III

## DISTINCT TYPES OF INSTRUCTIONAL AREAS TO BE PROVIDED

### QUANTITATIVE FACILITY NEEDS

The number of instructional areas to house the programs described in Part II (The Instructional Program) are recorded in this section of the guide.

As indicated in Part II, there are three principal types of instructional areas used to accommodate educational programs. They are:

*Lecture/demonstration areas*--used principally for group reaction learning;

*Seminar areas*--used principally for group interaction learning; and

*Laboratory areas*--used principally for group or individual action learning.

In addition to these instructional areas, there are, of course, other school-wide auxiliary areas such as instructional materials centers, language laboratories, gymnasiums, and auditoriums which are part of the overall school plan. Requirements for such facilities are calculated as a part of total school planning and are not made in this guide.

It is recommended that facility needs, including occupational preparation programs in automotive service, be made on a school-wide basis in order to provide planners with a balanced picture of the building to be constructed and in order to provide economy and convenience through the sharing and clustering of various kinds of facilities and equipment.

Forms B, C, and D can be used to compute the number of lecture/demonstration, seminar, and laboratory areas required, respectively, for the planned programs in automotive service. The use of these forms requires some mathematical ability. Personnel responsible for completing the guide may want to utilize the services of individuals with this special competence.

Results of the computations on Forms B, C, and D are entered on Form E which is a summary of total instructional area requirements for automotive service occupational preparation programs.

In the event that instructional area requirements are already determined (e.g., it has been decided that one combination laboratory and lecture/demonstration area will be provided) the information can be recorded directly on Form E without making the computations on Forms B, C, and D.

It is strongly recommended that appropriate personnel be utilized to ensure that the number of instructional areas is sufficient to meet program requirements. After the number of each type of instructional area is determined and recorded on Form E, information can then be recorded in the following section of the guide concerning the nature of these instructional areas.

## INSTRUCTIONS FOR COMPLETING FORM B
## LECTURE/DEMONSTRATION AREA REQUIREMENTS BY CONTENT AREAS

Column 1
*Content Area*--Content areas are listed in Column 1.

Column 2
*Total Enrollment*--To obtain total enrollment for content areas, find the total enrollment for each content area as indicated in Columns 7 and 8 of Form A(s) for all occupational preparation programs.

Column 3
*Maximum Group Size*--Opposite each content area, enter the maximum group size desired for a lecture/demonstration area to serve the content area (Form A, Column 9).

Column 4
*Total Weekly Periods or Modules*--Opposite each content area, enter the total periods or modules per week the school will be open for day school instruction. This entry will be identical for all content areas and identical to the number recorded for Item 5, Form A.

Column 5
*Total Weekly Reaction Group-Periods or Modules*--Opposite each content area, enter the total group periods or modules per week to be devoted to reaction learning as indicated in Column 11 of Form A(s) for all occupational preparation programs.

Column 6
*Lecture/Demonstration Areas Required*--Opposite each content area, enter the quotient of Item 5 divided by Item 4. Round up to the nearest hundredth.

Column 7
*Adjusted Lecture/Demonstration Areas Required*--To adjust for scheduling difficulties which result in areas being less than 100 percent utilized, multiply the entry in Column 6 by 1.3 and enter the result, rounded up to the nearest hundredth, in Column 7 for each content area.

Column 8
*Totals*--Since lecture/demonstration areas, unlike laboratory areas, can be utilized by nearly all content areas, the entries in Column 7 can be added for all lecture/demonstration areas with identical maximum group sizes as entered in Column 3. For example, 8a might read 2 lecture/demonstration areas with a student capacity of 50 each.

SAMPLE FORM B

LECTURE/DEMONSTRATION AREA REQUIREMENTS BY CONTENT AREA

| Content Area (1) | Total Enrollment (2) | Maximum Group Size (3) | Total Weekly Periods or Modules (4) | Total Weekly Reaction Group-Periods or Modules (5) | Lecture/Demonstration Areas Required (5) ÷ (4) (6) | Adjusted Lecture/Demonstration Areas Required (6) X 1.3 (7) |
|---|---|---|---|---|---|---|
| I Engines, Electrical and Fuel Systems | 120 | 40 | 30 | 9 | 0.30 | 0.39 |
| II Alignment and Steering | 40 | 40 | 30 | 3 | 0.10 | 0.13 |
| III Brakes and Power Systems | 40 | 40 | 30 | 3 | 0.10 | 0.13 |
| IV Drive Line and Transmissions | 0 | -- | -- | -- | -- | -- |
| V Accessories and Power Units | 0 | -- | -- | -- | -- | -- |
| VI Academic | 120 | 25 | 30 | 6 | 0.20 | 0.26 |
| VII Science | 40 | 25 | 30 | 4 | 0.13 | 0.17 |
| VIII Physical Education | 40 | 30 | 30 | 2 | 0.67 | 0.87 |
| IX Other (specify) | | | | | | |

(8) Totals (Figures in Column 7 can be added together for areas with same student capacity as entered in Column 3.) Round off total to next higher whole number.

a. 1 lecture/demonstration areas with a student capacity of 40, each.
b. 1 lecture/demonstration areas with a student capacity of 25, each.
c. 1 lecture/demonstration areas with a student capacity of 30, each.
d. _____ lecture/demonstration areas with a student capacity of _____, each.

Note: The entries in Column 7 indicate clearly that the lecture/demonstration areas would only be used sparingly by students enrolled in each of the content areas. One possibility might be construction of one lecture/demonstration area with a student capacity of 40 which could be subdivided to meet program requirements of all content areas. Another possibility would be the sharing of lecture/demonstration with other students enrolled in various other programs.

FORM B

LECTURE/DEMONSTRATION AREA REQUIREMENTS BY CONTENT AREAS

| Content Area (1) | Total Enrollment (2) | Maximum Group Size (3) | Total Weekly Periods or Modules (4) | Total Weekly Reaction Group-Periods or Modules (5) | Lecture/Demonstration Areas Required (5) ÷ (4) (6) | Adjusted Lecture/Demonstration Areas Required (6) X 1.3 (7) |
|---|---|---|---|---|---|---|
| I Engines, Electrical and Fuel Systems | | | | | | |
| II Alignment and Steering | | | | | | |
| III Brakes and Power Systems | | | | | | |
| IV Drive Line and Transmissions | | | | | | |
| V Accessories and Power Units | | | | | | |
| VI Academic | | | | | | |
| VII Science | | | | | | |
| VIII Physical Education | | | | | | |
| IX Other (specify) | | | | | | |

(8) Totals (Figures in Column 7 can be added together for areas with same student capacity as entered in Column 3.) Round off total to next higher whole number.

a. _____ lecture/demonstration areas with a student capacity of _____, each.
b. _____ lecture/demonstration areas with a student capacity of _____, each.
c. _____ lecture/demonstration areas with a student capacity of _____, each.
d. _____ lecture/demonstration areas with a student capacity of _____, each.

## INSTRUCTIONS FOR COMPLETING FORM C
## SEMINAR AREA REQUIREMENTS BY CONTENT AREAS

Column 1
*Content Area*--Content areas are listed in Column 1.

Column 2
*Total Enrollment*--To obtain total enrollment for content areas, find the total enrollment for each content area indicated in Column 7 and 8 of Form A(s) for all occupational preparation programs.

Column 3
*Maximum Group Size*--Opposite each content area, enter the maximum group size desired for a seminar area to serve the content area (Form A, Column 12).

Column 4
*Total Weekly Periods or Modules*--Opposite each content area, enter the total periods or modules per week the school will be open for day school instruction. This entry will be identical for all content areas and identical to the number recorded for Item 5, Form A.

Column 5
*Total Weekly Interaction Group-Periods or Modules*--Opposite each content area, enter the total group periods or modules per week to be devoted to interaction learning as indicated in Column 14 of Form A(s) for all occupational preparation programs.

Column 6
*Seminar Areas Required*--Opposite each content area, enter the quotient of Item 5 divided by Item 4. Round up to the nearest hundredth.

Column 7
*Adjusted Seminar Areas Required*--To adjust for scheduling difficulties which result in areas being less than 100 percent utilized, multiply the entry in Column 6 by 1.3 and enter the result, rounded up to the nearest hundredth, in Column 7 for each content area.

Column 8
*Totals*--Since seminar areas, unlike laboratory areas, can be commonly utilized by nearly all content areas, the entries in Column 8 can be added for all seminar areas with identical maximum group sizes or entered in Column 3. For example, 8a might read 2 seminar areas with a student capacity of 20, each.

SAMPLE FORM C

SEMINAR AREA REQUIREMENTS BY CONTENT AREAS

| Content Area (1) | Total Enrollment (2) | Maximum Group Size (3) | Total Weekly Periods or Modules (4) | Total Weekly Interaction Group-Periods or Modules (5) | Seminar Areas Required (5) ÷ (4) (6) | Adjusted Seminar Areas Required (6) X 1.3 (7) |
|---|---|---|---|---|---|---|
| I Engines, Electrical and Fuel Systems | *120* | *15* | *30* | *18* | *0.60* | *0.78* |
| II Alignment and Steering Systems | *40* | *15* | *30* | *6* | *0.20* | *0.26* |
| III Brakes and Power Systems | *40* | *15* | *39* | *6* | *0.20* | *0.26* |
| IV Drive Line and Transmissions | *0* | -- | -- | -- | -- | -- |
| V Accessories and Power Systems | *0* | -- | -- | -- | -- | -- |
| VI Academic | *120* | *15* | *30* | *12* | *0.40* | *0.52* |
| VII Science | *40* | *15* | *30* | *0* | -- | -- |
| VIII Physical Education | *40* | *15* | *30* | *3* | *0.10* | *0.10* |
| IX Other (specify) | | | | | | |

(8) Totals (Figures in Column 7 can be added together for areas with same student capacity as entered in Column 3.) Round up total to next higher whole number.

a. *2 (1.92)* seminar areas with a minimum student capacity of *15*, each.
b. _____ seminar areas with a minimum student capacity of _____, each.
c. _____ seminar areas with a minimum student capacity of _____, each.
d. _____ seminar areas with a minimum student capacity of _____, each.

FORM C

SEMINAR AREA REQUIREMENTS BY CONTENT AREAS

| Content Area (1) | Total Enrollment (2) | Maximum Group Size (3) | Total Weekly Periods or Modules (4) | Total Weekly Interaction Group-Periods or Modules (5) | Seminar Areas Required (5) ÷ (4) (6) | Adjusted Seminar Areas Required (6) X 1.3 (7) |
|---|---|---|---|---|---|---|
| I Engines, Electrical and Fuel Systems | | | | | | |
| II Alignment and Steering Systems | | | | | | |
| III Brakes and Power Systems | | | | | | |
| IV Drive Line and Transmissions | | | | | | |
| V Accessories and Power Systems | | | | | | |
| VI Academic | | | | | | |
| VII Science | | | | | | |
| VIII Physical Education | | | | | | |
| IX Other (specify) | | | | | | |

(8) Totals (Figures in Column 7 can be added together for areas with same student capacity as entered in Column 3.) Round up total to next higher whole number.

a. _____ seminar areas with a minimum student capacity of _____, each.
b. _____ seminar areas with a minimum student capacity of _____, each.
c. _____ seminar areas with a minimum student capacity of _____, each.
d. _____ seminar areas with a minimum student capacity of _____, each.

## INSTRUCTIONS FOR COMPLETING FORM D

## LABORATORY AREA REQUIREMENTS BY CONTENT AREAS

Column 1
*Content Area*--Content areas are listed in Column 1.

Column 2
*Total Enrollment*--To obtain total enrollment for content areas, find the total enrollment for each area as indicated in Columns 7 and 8 of Form A for all occupational preparation programs.

Column 3
*Maximum Group Size*--Opposite each content area, enter the maximum group size desired for a laboratory area to serve the content area (Form A, Column 15).

Column 4
*Total Weekly Periods or Modules*--Opposite each content area, enter the total periods or modules per week the school will be open for day school instruction. This entry will be identical for all content areas and identical to the number recorded for Item 5, Form A.

Column 5
*Total Weekly Action Group-Periods or Modules*--Opposite each content area, enter the total group periods or modules per week to be devoted to action learning as indicated in Column 17 of Form A(s) for all occupational preparation programs.

Column 6
*Laboratory Areas Required*--Opposite each content area, enter the quotient of Item 5 divided by Item 4. Round up to the nearest hundredth.

Column 7
*Adjusted Laboratory Areas Required*--To adjust for scheduling difficulties which result in areas being less than 100 percent utilized, multiply the entry in Column 6 by 1.3 and enter the result, rounded up to the nearest hundredth, in Column 7 for each content area.

SAMPLE FORM D

LABORATORY AREA REQUIREMENTS BY CONTENT AREAS

| Content Areas (1) | Total Enrollment (2) | Maximum Group Size (3) | Total Weekly Periods or Modules (4) | Total Weekly Action Group-Periods or Modules (5) | Laboratory Areas Required (5) ÷ (4) (6) | Adjusted Areas Required (6) X 1.3 (7) |
|---|---|---|---|---|---|---|
| I Engines, Electrical and Fuel Systems | 120 | 15 | 30 | 45 | 1.50 | 1.95 |
| II Alignment and Steering Systems | 40 | 15 | 30 | 15 | 0.50 | 0.65 |
| III Brakes and Power Systems | 40 | 15 | 30 | 21 | 0.70 | 0.91 |
| IV Drive Line and Transmissions | 0 | -- | -- | -- | -- | -- |
| V Accessories and Power Systems | 0 | -- | -- | -- | -- | -- |
| VI Physical Education | 40 | 35 | 30 | 4 | 0.13 | 0.17 |
| VII Science | 40 | 35 | 30 | 15 | 0.50 | 0.65 |
| | | | | | | |

SAMPLE FORM D

FORM D

LABORATORY AREA REQUIREMENTS BY CONTENT AREAS

| Content Areas (1) | Total Enrollment (2) | Maximum Group Size (3) | Total Weekly Periods or Modules (4) | Total Weekly Action Group-Periods or Modules (5) | Laboratory Areas Required (5) ÷ (4) (6) | Adjusted Areas Required (6) X 1.3 (7) |
|---|---|---|---|---|---|---|
| I Engines, Electrical and Fuel Systems | | | | | | |
| II Alignment and Steering Systems | | | | | | |
| III Brakes and Power Systems | | | | | | |
| IV Drive Line and Transmissions | | | | | | |
| V Accessories and Power Systems | | | | | | |
| VI Physical Education | | | | | | |
| VII Science | | | | | | |
| | | | | | | |

FORM D

SAMPLE FORM E

SUMMARY OF FACILITY REQUIREMENTS FOR OCCUPATIONAL PREPARATION PROGRAMS IN AUTOMOTIVE SERVICES

| Instructional Areas (1) | Number Required* | | Required Student Capacity (4) |
|---|---|---|---|
| | Calculated Forms B, C, D Column 7 (2) | Next Higher Whole Number (3) | |
| Lecture/Demonstration | 0.65 | 1 | 40 |
| 1 Lecture/Demonstration | | | |
| Lecture/Demonstration | | | |
| Lecture/Demonstration | | | |
| Seminar | 1.92 | 2 | 15 |
| 2 Seminar | | | |
| Seminar | | | |
| Seminar | | | |
| Engines, Electrical, and Fuel Systems Laboratory | 0.78 | 1 | 15 |
| Alignment and Steering Systems Laboratory | | | |
| 3 Brakes and Power System Laboratory | | | |
| Drive Line and Transmission Laboratory | | | |
| Accessories and Power Systems Laboratory | | | |
| | | | |

4 Multi-purpose areas

If any of the specialized areas entered above are to be combined as multi-purpose areas, indicate the combinations desired.

a. *Drive Line and Transmission Laboratory Area and Seminar Area*

b. _____

c. _____

d. _____

5 Summary of facility requirements for automotive services occupational preparation program requirements. Based on the above entries, summarize the total quantitative facility requirements for the planned program.

_____

_____

_____

_____

_____

_____

*Enter the number of instructional areas needed for each student capacity required. In the event that the numbers required indicate that an area will be used only sparingly, consideration should be given to sharing lecture/demonstration and seminar areas with other training programs or the construction of high student capacity areas which are capable of being subdivided for instructional purposes.

FORM E

SUMMARY OF FACILITY REQUIREMENTS FOR OCCUPATIONAL PREPARATION PROGRAMS IN AUTOMOTIVE SERVICES

| Instructional Areas (1) | Number Required* | | Required Student Capacity (4) |
|---|---|---|---|
| | Calculated Forms B, C, D Column 7 (2) | Next Higher Whole Number (3) | |
| Lecture/Demonstration | | | |
| Lecture/Demonstration | | | |
| Lecture/Demonstration | | | |
| Lecture/Demonstration | | | |
| Seminar | | | |
| Seminar | | | |
| Seminar | | | |
| Seminar | | | |
| Engines, Electrical, and Fuel Systems Laboratory | | | |
| Alignment and Steering Systems Laboratory | | | |
| Brakes and Power System Laboratory | | | |
| Drive Line and Transmission Laboratory | | | |
| Accessories and Power Systems Laboratory | | | |
| | | | |

1

2

3

4 Multi-purpose areas
If any of the specialized areas entered above are to be combined as multi-purpose areas, indicate the combinations desired.

a. _____
b. _____
c. _____
d. _____

5 Summary of facility requirements for automotive services occupational preparation program requirements. Based on the above entries, summarize the total quantitative facility requirements for the planned program.

_____
_____
_____
_____
_____
_____

*Enter the number of instructional areas needed for each student capacity required. In the event that the numbers required indicate that an area will be used only sparingly, consideration should be given to sharing lecture/demonstration and seminar areas with other training programs or the construction of high student capacity areas which are capable of being subdivided for instructional purposes.

## QUALITATIVE FACILITY NEEDS

In this section, detailed information on the kind of instructional areas required is recorded. Special forms are provided for describing the nature of lecture/demonstration areas, seminar areas, laboratory areas, and auxiliary areas to be provided. For each general type of instructional area required information is sought in the following categories.

1. The relationship of the area to other instructional areas (specialized versus multi-purpose utilization of space).

2. The number of these kinds of areas needed.

3. The activities of students and teachers in the instructional area.

4. The spatial relationships within the area and the area's spatial relationships to other instructional areas and the building as a whole.

5. The furniture and equipment required for the area.

6. The environmental factors required for the area.

7. The special utility services required for the area.

8. The minimal space requirements for the area.

FORM F

## DESCRIPTION OF LECTURE/DEMONSTRATION AREA(S) TO BE USED PRINCIPALLY FOR GROUP REACTION LEARNING

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. The lecture/demonstration area(s) should be planned:

| | | |
|---|---|---|
| a. As independent unit(s) | Yes | No |
| b. In combination with _____ laboratory area(s) (specify) | Yes | No |
| c. In combination with seminar area(s) | Yes | No |
| d. As an area within a single multi-use area | Yes | No |

2. Number of lecture/demonstration areas required for the desired program (see Form E) _____

3. Student and instructor activities in this space. Indicate the extent to which each of the activities listed below will occur.

| | | | | |
|---|---|---|---|---|
| a. Listening to lectures | 1 | 2 | 3 | N |
| b. Observing demonstrations | 1 | 2 | 3 | N |
| c. Taking notes | 1 | 2 | 3 | N |
| d. Viewing films, slides, overhead projections, etc. | 1 | 2 | 3 | N |
| e. _____ | 1 | 2 | 3 | N |
| f. _____ | 1 | 2 | 3 | N |

4. Spatial relationships. Indicate the extent to which the lecture/demonstration area(s) should be accessible to the:

| | | | | |
|---|---|---|---|---|
| a. Instructional materials center | 1 | 2 | 3 | N |
| b. Building entrance | 1 | 2 | 3 | N |
| c. Delivery area | 1 | 2 | 3 | N |
| d. Other instructional areas | | | | |
| 1) _____ | 1 | 2 | 3 | N |
| 2) _____ | 1 | 2 | 3 | N |
| 3) _____ | 1 | 2 | 3 | N |
| e. Other building areas | | | | |
| 1) _____ | 1 | 2 | 3 | N |
| 2) _____ | 1 | 2 | 3 | N |
| 3) _____ | 1 | 2 | 3 | N |

5. Furniture and equipment

| | | | |
|---|---|---|---|
| a. Student seating | | | |
| 1) Individual desks and chairs | P | A | NA* |

*Code: P = Preferred; A = Acceptable; NA = Not Acceptable. This scale is used frequently on the following pages.

a) Number of desks and chairs required
b) Provision for storage — Yes / No

2) Permanent-type desk
a) Number required
b) Provision for storage — Yes / No

3) Desk and chair combination
a) Number required
b) Provision for storage — Yes / No

4) Tables and chairs
a) Number of tables required
b) Number of chairs required
c) Provision for storage — Yes / No

5) Auditorium-type seating
Number of seats required

b. Stage
1) Permanent type — Yes / No
2) Portable type — P / A / NA
The approximate area in square feet desired

c. Sound amplifying system — P / A / NA
d. Controls for regulating light intensity — P / A / NA
e. Lectern
1) Permanent type — Yes / No
2) Portable type — P / A / NA
3) Provision for storage — P / A / NA
f. Projection screen
1) Built-in type — Yes / No
2) Portable type — Yes / No
3) Approximate dimensions — P / A / NA
4) Provision for storage — P / A / NA

g. Other equipment requirements for lecture/demonstration area(s) are:
1) _____
2) _____
3) _____
4) _____

6. Environmental factors

a. Aesthetic. Factors to be considered in the aesthetic domain are colors, light, style of architecture, design and the like. Indicate any special aesthetic considerations important to the planning of the lecture/demonstration area(s).

_____
_____
_____

b. Aerial. Factors to be considered in this category include air temperature, radiant temperature, relative humidity, and ventilation. Indicate any special considerations important to the planning of the lecture/demonstration area(s).

c. Visual. A properly controlled and balanced visual environment is important. The visual environment affects such things as accuracy in perception, attention to tasks, and speed of performance. Indicate any special factors which should be taken into account in planning the visual environment of the lecture/demonstration area(s).

d. Sonic. Factors to be considered in this category include such things as acoustical requirements and sound systems. Indicate any special considerations important to the planning of the lecture/demonstration area(s).

e. Safety. In planning a school building, safety for students and instructors is of prime concern. Indicate any special safety considerations which have implications for design of the lecture/demonstration area(s).

7. Vertical instructional surfaces

| | | |
|---|---|---|
| a. Chalkboard | Yes | No |
| 1) Wall-mounted | P A | NA |
| Number of lineal feet | | |
| 2) Portable | P A | NA |
| Provision for storage | Yes | No |
| b. Tack board | Yes | No |
| Number of lineal feet | | |
| c. Pegboard | Yes | No |
| Number of lineal feet | | |

8. Special utility services required

| | | |
|---|---|---|
| a. Electricity | | |
| 1) Projection equipment | Yes | No |
| 2) Sound amplifying equipment | Yes | No |
| 3) Electrical needs for other equipment (specify) | Yes | No |
| a) | | |
| b) | | |
| c) | | |
| d) | | |

b. Other utility needs for the lecture/demonstration area(s)

1) _____
2) _____
3) _____
4) _____

9. The minimum space requirement in square feet for each lecture/demonstration area (optional). _____ (The planner should be aware of any state or local regulation or recommendations concerning floor space requirements.)

10. Other important factors to be considered in the planning of the lecture/demonstration area(s) are:

FORM G

## DESCRIPTION OF SEMINAR AREA(S) TO BE USED PRINCIPALLY FOR GROUP INTERACTION LEARNING

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. The seminar area(s) should be planned:

| | | |
|---|---|---|
| a. As independent unit(s) | Yes | No |
| b. In combination with _____ laboratory area(s) (specify) | Yes | No |
| c. In combination with lecture/demonstration area(s) | Yes | No |
| d. As an area within a single multi-use area | Yes | No |

2. The number of seminar area(s) required for the desired program (see Form E) _____

3. Student and instructor activities in this space. Indicate the extent to which each of the activities listed below will occur.

| | | | | |
|---|---|---|---|---|
| a. Small group discussing | 1 | 2 | 3 | N |
| b. Viewing films, slides, overhead projections, etc. | 1 | 2 | 3 | N |
| c. Demonstrating | 1 | 2 | 3 | N |
| d. Reporting | 1 | 2 | 3 | N |
| e. Working on projects | 1 | 2 | 3 | N |
| f. _____ | 1 | 2 | 3 | N |
| g. _____ | 1 | 2 | 3 | N |

4. Spatial relationships. Indicate the extent to which the seminar area(s) should be accessible to the:

| | | | | |
|---|---|---|---|---|
| a. Instructional materials center | 1 | 2 | 3 | N |
| b. Building entrance | 1 | 2 | 3 | N |
| c. Delivery area | 1 | 2 | 3 | N |
| d. Other instructional areas | | | | |
| 1) _____ | 1 | 2 | 3 | N |
| 2) _____ | 1 | 2 | 3 | N |
| 3) _____ | 1 | 2 | 3 | N |
| e. Other building areas | | | | |
| 1) _____ | 1 | 2 | 3 | N |
| 2) _____ | 1 | 2 | 3 | N |
| 3) _____ | 1 | 2 | 3 | N |

5. Furniture and equipment

| | | |
|---|---|---|
| a. Seminar table | Yes | No |
| 1) Number required | _____ | |
| 2) Seating for how many persons | _____ | |
| 3) Permanent type | P A | NA |

4) Portable type — P A NA
5) Provision for storage — Yes No

b. Chairs
1) Number required
2) Straight-back type — P A NA
3) Folding type — P A NA
4) Provision for storage — Yes No

c. Other equipment requirements for seminar area(s) are:
1) _____
2) _____
3) _____
4) _____

6. Environmental factors

a. Aesthetic. Factors to be considered in the aesthetic domain are colors, light, style of architecture, design and the like. Indicate any special aesthetic considerations important to the planning of seminar areas.

_____
_____
_____

b. Aerial. Factors to be considered in this category include air temperature, radiant temperature, relative humidity, and ventilation. Indicate any special considerations important to the planning of the seminar area(s).

_____
_____
_____

c. Visual. A properly controlled and balanced visual environment is important. The visual environment affects such things as accuracy in perception, attention to tasks, and speed of performance. Indicate any special factors which should be taken into account in planning the visual environment of the seminar area(s).

_____
_____
_____

d. Sonic. Factors to be considered in this category include such things as acoustical requirements and sound system. Indicate any special considerations important to the planning of the seminar area(s).

_____
_____
_____

e. Safety. In planning a school building, safety for students and instructors is of prime concern. Indicate any special safety considerations which have implications for design of the seminar area(s).

8. Vertical instructional surfaces

| | | |
|---|---|---|
| a. Chalkboard | Yes | No |
| 1) Wall-mounted | P A | NA |
| 2) Number of lineal feet | | |
| 3) Portable | P A | NA |
| 4) Provision for storage | Yes | No |
| b. Tack board | Yes | No |
| Number of lineal feet | | |
| c. Pegboard | Yes | No |
| Number of lineal feet | | |

9. Special utility services required

| | | |
|---|---|---|
| a. Electricity | | |
| 1) Projection equipment | Yes | No |
| 2) Sound amplifying equipment | Yes | No |
| 3) Electrical needs for other equipment (specify) | | |

b. Other utility needs for the seminar area(s)
   1) _____
   2) _____
   3) _____
   4) _____

10. Minimum space requirement in square feet for each seminar area (optional) _____. (The planner should be aware of any state or local regulations or recommendations concerning floor space requirements.)

11. Other important factors to be considered in the planning of the seminar area(s) are:

FORM H

## DESCRIPTION OF ENGINE, ELECTRICAL AND FUEL LABORATORY AREA(S) TO BE USED PRINCIPALLY FOR ACTION LEARNING

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. The engine, electrical and fuel laboratory should be planned:

| | | |
|---|---|---|
| a. As one independent unit | Yes | No |
| b. As a combination with _____ (specify) other units | Yes | No |
| c. As part of a complete service laboratory | Yes | No |
| d. As three separate units | Yes | No |
| e. In combination with lecture/demonstration space | Yes | No |
| f. As an area within a single multi-use area | Yes | No |

2. Student capacity required for scheduled activities (see Form E) _____

3. Student and instructor activities and space arrangements in various space divisions within the engine, electrical and fuel laboratory area(s). Indicate the extent to which each activity will occur.

| | | | | |
|---|---|---|---|---|
| a. Automotive engine area (engine out of car--mounted on stand) | | | | |
| 1) Working on heads and cylinder block | 1 | 2 | 3 | N |
| 2) Valves and valve mechanisms | 1 | 2 | 3 | N |
| 3) Piston and connecting rod assembly | 1 | 2 | 3 | N |
| 4) Crankshaft and bearings | 1 | 2 | 3 | N |
| 5) Lubrication systems oil pump and filter | 1 | 2 | 3 | N |
| 6) Cooling systems | 1 | 2 | 3 | N |
| 7) Exhaust systems | 1 | 2 | 3 | N |
| 8) Crankcase and ventilation systems | 1 | 2 | 3 | N |
| b. Automotive engine area | | | | |
| 1) Automotive engine dynamometer | 1 | 2 | 3 | N |
| 2) Automotive engines in car--stalls for cars for work on engine | 1 | 2 | 3 | N |
| 3) Indicate number of stalls needed in engine area | _____ | | | |
| 4) Indicate space requirements needed for each mounted engine | _____ | | | |
| 5) Indicate number of mounted engines needed | _____ | | | |
| c. Automotive electrical area | | | | |
| 1) Basic electrical | 1 | 2 | 3 | N |
| 2) Battery area | 1 | 2 | 3 | N |
| 3) Diagnosis of electrical malfunctions | 1 | 2 | 3 | N |

H

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

| | | |
|---|---|---|
| 4) Starting systems | | 1 2 3 N |
| 5) Ignition systems | | 1 2 3 N |
| 6) Charging systems | | 1 2 3 N |
| 7) Lighting and warming systems | | 1 2 3 N |
| d. Stalls for automotive electrical work on live cars | | |
| 1) Number of stalls needed | | _____ |
| 2) Area of each stall | | _____ |
| 3) Parking arrangement | | |
| a) 90° from aisle | | Yes No |
| b) 60° from aisle | | Yes No |
| c) 45° from aisle | | Yes No |
| d) Individual door aisle | | Yes No |
| 4) Minimum space | From Wall | Width |
| a) 90° from aisle | _____ | _____ |
| b) 60° from aisle | _____ | _____ |
| c) 45° from aisle | _____ | _____ |
| d) Individual door aisle | _____ | _____ |
| 5) Car space combined with other instructional area | | Yes No |
| 6) Indicate combination | | _____ |
| e. Carburetion and fuel systems | | |
| 1) Automotive engine area--engines mounted on engine stands and operable | | 1 2 3 N |
| 2) Single carburetor | | 1 2 3 N |
| 3) Two barrel carburetor | | 1 2 3 N |
| 4) Four barrel carburetor | | 1 2 3 N |
| 5) High performance carburetor | | 1 2 3 N |
| 6) Fuel injection | | 1 2 3 N |
| 7) Fuel pump--mechanical | | 1 2 3 N |
| 8) Fuel pump--electrical | | 1 2 3 N |
| 9) Manifold systems | | 1 2 3 N |
| 10) Fuel pump testing pressure--volume | | 1 2 3 N |
| 11) Vacuum tests | | 1 2 3 N |
| 12) Filters and filter service | | 1 2 3 N |
| f. Stalls for carburetor and fuel | | |
| 1) Number of stalls needed | | _____ |
| 2) Parking arrangement--refer to d.3) | | _____ |
| 3) Space combined with electrical and engine | | Yes No |
| g. Storage space needed | | |
| 1) Storage of extra mounted engines | | Yes No |
| 2) Amount of space needed | | ____sq.ft. |
| 3) Storage for electrical units | | Yes No |
| 4) Amount of storage space needed | | ____sq.ft. |
| 5) Storage of carburetion units | | Yes No |
| 6) Amount of storage space needed | | ____sq.ft. |
| 7) Outside parking for live work | | Yes No |
| 8) Amount of parking needed | | ____sq.ft. |

4. Spatial relationships to other areas

| | Yes | No |
|---|---|---|
| a. Accessibility to chassis dynamometer | | |
| b. Other (specify) _____ | | |

5. Equipment

| | Yes | | No |
|---|---|---|---|
| a. Dynamometer--engine | | | |
| Number of engine dynamometers required | P | A | NA |
| b. Engines mounted in stands | | | |
| Number of mounted engines required | | | |
| c. Work benches in engine area | | | |
| 1) Standard free standing service benches | P | A | NA |
| 2) Wall hung service benches | P | A | NA |
| 3) Area of bench spaces needed | | | |
| 4) Relationship of bench areas to engine area--describe _____ | | | |
| 5) Relationship of bench areas to service stalls--describe _____ | | | |
| d. Electrical equipment | | | |
| 1) Master automotive engine analyzer | P | A | NA |
| Number of master engine analyzers needed | | | |
| 2) Generator--alternator--regulator tester | P | A | NA |
| Number of generator, alternator and regulator testers needed | | | |
| 3) Distributor tester | P | A | NA |
| Number of distributor testers needed | | | |
| 4) Portable starter--battery tester | P | A | NA |
| Number of starter--battery testers needed | | | |
| 5) Combustion analyzer | P | A | NA |
| Number of combustion analyzers needed | | | |
| 6) Portable alternator--generator test stand | P | A | NA |
| Number of portable alternator, generator test stands needed | | | |
| 7) Portable ignition analyzer | P | A | NA |
| Number of ignition analyzers needed | | | |
| 8) Coil, condenser tester | P | A | NA |
| Number of coil condenser testers needed | | | |
| 9) Volt, ampere tester | P | A | NA |
| Number of volt, ampere testers needed | | | |

10) Electrical unit with separate removable meters: A.V.R., Dwell, Tach, Combustion, Volt-amp. — P A NA
   a) Indicate specific meters needed in unit _____
   _____
   _____
   b) Number of above units needed _____
11) Fast charge battery charger — P A NA
   Number of fast charge battery chargers needed _____
12) Slow charge battery chargers — P A NA
   Number of slow charge battery chargers needed _____
13) Combination fast-slow charge battery chargers — P A NA
   Number of combination fast-slow charge battery chargers needed _____
14) Spark plug cleaner — P A NA
   Number of spark plug cleaners needed _____
15) Ignition simulator — P A NA
   Number of ignition simulators needed _____

e. Engine equipment — P A NA
1) Portable crane
   a) Capacity of crane
      (1) 2000# — Yes No
      (2) 1000# — Yes No
   b) Number needed _____
2) Portable engine stands — P A NA
   Number of portable engine stands needed _____
3) Honing machine — P A NA
   Number of honing machines needed _____
4) Cap and rod grinder — P A NA
   Number of cap and rod grinders needed _____
5) Rod aligner — P A NA
   Number of rod aligners needed _____
6) Valve refacer — P A NA
   Number of valve refacers needed _____
7) Valve reconditioning shop (seats and valves) — P A NA
   Number of valve reconditioning shops needed _____
8) Hydraulic press — P A NA
   Number of hydraulic presses needed _____
9) Three ton arbor press — P A NA
   Number of arbor presses needed _____
10) Engine cleaning machine — P A NA
   a) Number of engine cleaning machines needed _____
   b) State type and size _____
   _____

6. Environmental factors

a. Aesthetic. Factors to be considered in the aesthetic domain are colors, light, style of architecture, design and the like. Indicate any special aesthetic considerations important to the planning of the engine, electrical, and fuel laboratory area(s).

b. Aerial. Factors to be considered in this category include air temperature, radiant temperature, relative humidity, and ventilation. Indicate any special considerations important to the planning of the engine, electrical, and fuel laboratory area(s).

c. Visual. A properly controlled and balanced visual environment is important. The visual environment affects such things as accuracy in perception, attention to tasks, and speed of performance. Indicate any special factors which should be taken into account in planning the visual environment of the engine, electrical, and fuel laboratory area(s).

d. Safety. In planning school buildings, safety for students and instructors is of prime concern. Indicate any special safety considerations which have implications of the engine, electrical, and fuel laboratory area(s).

7. Vertical instructional surfaces

| | Yes | | No |
|---|---|---|---|
| a. Chalkboard | P | A | NA |
| 1) Wall-mounted | | | |
| Number of lineal feet | P | A | NA |
| 2) Portable | | | |
| a) Number of lineal feet | Yes | | No |
| b) Provision for storage | Yes | | No |
| b. Tack board | | | |
| Number of lineal feet | Yes | | No |
| c. Pegboard | | | |
| Number of lineal feet | | | |

8. Special utilities needed

FORM H

a. Electricity
   1) Generator--alternator tester
      a) 110V 60C 1 Phase — Yes No
      b) 220V 60C 1 Phase — Yes No
      c) 220V 60C 3 Phase — Yes No
   2) Location of 110V outlets for electrical test units (list)
      a) _____
      b) _____
      c) _____
      d) _____
      e) _____
      f) _____
   3) Location of 110V outlets for other mechanical equipment (list)
      a) _____
      b) _____
      c) _____
      d) _____
      e) _____
   4) Special lighting requirements (specify)
      a) _____
      b) _____
      c) _____
      d) _____
      e) _____
   5) Electrical distribution for dynamometer. If electrical specify special concerns to dissipate power generated--or heat generated.
      _____
      _____
      _____
      _____
      _____

b. Water
   1) Water supply to engine dynamometer if absorption unit is water cooled — Yes No
   2) Minimum size of water supply to engine dynamometer _____
   3) Minimum size of drain to dispose of water from the engine dynamometer _____
   4) Water supply to mounted engine units if cooled by water from the line — Yes No
   5) Size of supply to each engine station if used _____
   6) Size and disposition of return water (i.e., drain to floor drain to keep floor drain clean) size _____ disposition _____

c. Gasoline
   1) Gasoline supply to dynamometer — Yes No
   2) Gasoline supply to mounted engines — Yes No
   3) Limit of storage capacity within the lab in keeping within local codes — gal. _____
   4) Distribution of gasoline to units

a) Pump — P A NA
b) Gravity — P A NA
c) Underground — P A NA

5) Description of gasoline system ____

_____

_____

_____

_____

d. Exhaust system

1) Exhaust from engine mounted in dynamometer — Yes No
2) Exhaust from mounted engines — Yes No
   a) Overhead — P A NA
   b) In the floor — P A NA
   c) Connected to central system — P A NA
   d) Separate system — P A NA
3) Describe how outlets will be connected to:
   a) Engines _____
   b) Dynamometer _____
   c) Cars in stalls _____

e. Installation

1) Special footing needed for engine dynamometer — Yes No
2) Describe special footing and size and location for:
   a) Dynamometer _____

_____

_____

_____

b) Engine stand attached to or adjacent to absorption unit _____

_____

_____

c) Other special conditions to be met concerning floor weight, concealed elements in the floor, or units attached to the wall _____

_____

_____

_____

9. Minimum space requirements in square feet

a. Floor area needed for the entire engine, electrical and fuel laboratory _____
b. If distinct space divisions are desired according to function, give minimum floor area requirements in square feet for each of the following areas if included in the desired program:
   1) Dynamometer area _____
   2) Mounted engine area _____
   3) Engine area for live cars _____

4) Engine area for benches _____
5) Electrical area _____
6) Storage area--engines _____
7) Storage area--electrical _____
8) Storage area--carburetor _____
9) _____ _____
10) _____ _____
11) _____ _____
12) _____ _____

10. Other important factors to be considered in the planning of the automotive engine, electrical and fuel laboratory area(s) are:

FORM I

## DESCRIPTION OF ALIGNMENT AND STEERING LABORATORY AREA(S) TO BE USED PRINCIPALLY FOR ACTION LEARNING

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. The alignment and steering laboratory should be planned:

| | | |
|---|---|---|
| a. As an independent unit(s) | Yes | No |
| b. In combination with seminar area(s) | Yes | No |
| c. In combination with _____ (specify) laboratory area(s) | Yes | No |
| d. As a part of a complete automotive service laboratory | Yes | No |
| e. As a combination of separate units i.e., alignment, steering, balancing | Yes | No |
| f. In combination with lecture/demonstration area(s) | Yes | No |
| g. As an area within a single multi-use purpose area | Yes | No |

2. Student capacity required for scheduled activities (see Form E) _____

3. Student and instructor activities in various areas involved in the alignment and steering area(s).
Indicate the extent to which each activity will occur.

| | | | | |
|---|---|---|---|---|
| a. Alignment space | | | | |
| 1) Check and adjust camber | 1 | 2 | 3 | N |
| 2) Check and adjust caster | 1 | 2 | 3 | N |
| 3) Check and adjust toe in | 1 | 2 | 3 | N |
| 4) Check and correct steering geometry (toe out on turns) | 1 | 2 | 3 | N |
| 5) Check and correct rear wheel camber | 1 | 2 | 3 | N |
| 6) Check and correct rear wheel toe | 1 | 2 | 3 | N |
| 7) Check and correct rear wheel track | 1 | 2 | 3 | N |
| 8) Check suspension specifications | 1 | 2 | 3 | N |
| 9) Other (specify) _____ | 1 | 2 | 3 | N |
| b. Steering space | | | | |
| 1) Disassemble, assemble and identify all parts of each type of steering gear | 1 | 2 | 3 | N |
| 2) Disassemable, assemble and identify parts of power steering units | 1 | 2 | 3 | N |
| 3) Adjust each steering gear worked on | 1 | 2 | 3 | N |
| 4) Adjust steering gear and all linkage on live automobile | 1 | 2 | 3 | N |
| 5) Adjust wheel to "straight ahead" position | 1 | 2 | 3 | N |
| c. Wheel balancing | | | | |

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

| | | | | | |
|---|---|---|---|---|---|
| 1) | Demonstrate wheel balancing using the on-the-car balancer | 1 | 2 | 3 | N |
| 2) | Demonstrate wheel balancing using the off-the-car balancer | 1 | 2 | 3 | N |
| 3) | Balance wheels using the on-the-car balancer | 1 | 2 | 3 | N |
| 4) | Balance wheels using the off-the-car balancer (dynamic) | 1 | 2 | 3 | N |
| 5) | Balance wheels using the off-the-car balancer (bubble) | 1 | 2 | 3 | N |
| 6) | Correction of out of balance conditions by truing tire | 1 | 2 | 3 | N |

4. Spatial relationships desired

a. Areas within the alignment and steering laboratory area(s) (e.g., alignment rack adjacent to wheel balancing area)
   1) _____
   2) _____
   3) _____
   4) _____

b. Laboratory areas to other building areas (e.g., alignment and steering laboratory adjacent to building delivery area)
   1) _____
   2) _____
   3) _____
   4) _____

5. Equipment

| | | | | |
|---|---|---|---|---|
| a. | Pit installed alignment rack | P | A | NA |
| 1) | Number required | | | |
| 2) | Other (specify) _____ | | | |
| b. | Above floor alignment rack | P | A | NA |
| 1) | Number required | | | |
| 2) | Optical system of amplification | P | A | NA |
| 3) | Electrical system of amplification | P | A | NA |
| 4) | Mechanical system of amplification | P | A | NA |
| 5) | Other (specify) _____ | | | |
| c. | Portable alignment system | P | A | NA |
| 1) | Number required | | | |
| 2) | Optical system | P | A | NA |
| 3) | Mechanical system | P | A | NA |
| 4) | Bubble gage system | P | A | NA |
| 5) | Other (specify) _____ | | | |
| d. | Wheel balancing equipment | P | A | NA |
| 1) | On the car balancer | P | A | NA |

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

| | | |
|---|---|---|
| 2) | Number needed | _____ |
| 3) | Type of balancer | |
| | a) Electronic | Yes No |
| | b) Shifting weights | Yes No |
| | c) Stroboscopic | Yes No |
| 4) | Off-the-car balancer | |
| | a) Static | P A NA |
| | b) Dynamic | P A NA |
| 5) | Number of off-the-car balancers needed | _____ |
| 6) | Tire changing equipment | P A NA |
| | a) Electric | 1 2 3 N |
| | b) Air operated | 1 2 3 N |
| 7) | Power requirements | |
| | a) 110V | Yes No |
| | b) 220V | Yes No |
| | c) Shop air pressure | Yes No |
| 8) | Other (specify) _____ | _____ |

6. Environmental factors

a. Aesthetic. Factors to be considered in the aesthetic domain are colors, light, style of architecture, design and the like. Indicate any special aesthetic considerations important to the planning of the alignment and steering laboratory area.

_____

_____

_____

b. Aerial. Factors to be considered in this category include air temperature, radiant temperature, relative humidity, and ventilation. Indicate any special considerations important to the planning of the alignment and steering laboratory area.

_____

_____

_____

c. Visual. A properly controlled and balanced visual environment is important. The visual environment affects such things as accuracy in perception, attention to tasks, and speed of performance. Indicate any special factors which should be taken into account in planning the visual environment of the alignment and steering laboratory area.

_____

_____

_____

d. Sonic. Factors to be considered in this category include such things as acoustical requirements and sound systems.

Indicate any special considerations important to the planning of the alignment and steering laboratory area.

_____

_____

_____

_____

e. Safety. In planning a school building safety for students and instructors is of prime concern. Indicate any special safety considerations which have implications for design of the alignment and steering laboratory area.

_____

_____

_____

_____

7. Vertical instructional surfaces

| | | |
|---|---|---|
| a. Chalkboard | Yes | No |
| 1) Wall-mounted | P A | NA |
| Number of lineal feet | _____ | |
| 2) Portable | P A | NA |
| a) Number of lineal feet | _____ | |
| b) Provision for storage | Yes | No |
| b. Tack board | Yes | No |
| Number of lineal feet | _____ | |
| c. Pegboard | Yes | No |
| Number of lineal feet | _____ | |

8. Special utilities needed (describe)

a. Electricity

_____

_____

_____

_____

b. Water

_____

_____

_____

_____

c. Gas

_____

_____

_____

_____

d. Compressed air

_____

_____

_____

_____

e. Other (specify)

_____

_____

_____

_____

9. Minimum floor areas in square feet (optional)

   a. Floor area in square feet desired for entire alignment and steering laboratory area ____sq.ft.

   b. If distinct space divisions within the alignment and steering laboratory area are desired according to function, give minimum floor areas for the various areas within the total laboratory area.

      1) _____ ____sq.ft.
      2) _____ ____sq.ft.
      3) _____ ____sq.ft.
      4) _____ ____sq.ft.

10. Other important factors to be considered in the planning of the alignment and steering laboratory area(s) are:

FORM J

## DESCRIPTION OF BRAKE AND BRAKE POWER SYSTEMS LABORATORY AREA(S) TO BE USED PRINCIPALLY FOR ACTION LEARNING

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. The brake and brake power systems laboratory should be planned:

| | | |
|---|---|---|
| a. As an independent unit(s) | Yes | No |
| b. In combination with lecture/demonstration area(s) | Yes | No |
| c. In combination with _____ (specify) laboratory area(s) | Yes | No |
| d. In combination with seminar area(s) | Yes | No |
| e. As an area within a single multi-use area | Yes | No |

2. Student capacity required for scheduled activities (see Form E) _____

3. Student and instructor activities and physical arrangements in various space divisions within the brake service and brake power systems laboratory area(s).

| | | | | |
|---|---|---|---|---|
| a. Minor brake service area | | | | |
| 1) Check pedal height and travel | 1 | 2 | 3 | N |
| 2) Check condition of hydraulic lines | 1 | 2 | 3 | N |
| 3) Remove wheels and check condition of brake lining and drums | 1 | 2 | 3 | N |
| 4) Check condition of U-bolts | 1 | 2 | 3 | N |
| 5) Check condition of shock absorbers | 1 | 2 | 3 | N |
| 6) Check condition of rubber bushings and ball joints | 1 | 2 | 3 | N |
| 7) Check fluid level of master cylinder | 1 | 2 | 3 | N |
| 8) Other (specify) _____ | | | | |
| b. Brake adjustment area | | | | |
| 1) Fixed anchor type--adjustment | 1 | 2 | 3 | N |
| 2) Huck brake--adjustment | 1 | 2 | 3 | N |
| 3) Wagner brake--self-centering adjustment | 1 | 2 | 3 | N |
| 4) Center plane total contact adjustment | 1 | 2 | 3 | N |
| 5) Bendix self-centering adjustment | 1 | 2 | 3 | N |
| 6) Bendix duo-servo--adjustment | 1 | 2 | 3 | N |
| 7) Disc brake | | | | |
| a) Chrysler self-adjusting | 1 | 2 | 3 | N |
| b) Caliper disc-adjusting | 1 | 2 | 3 | N |
| 8) Adjust parking brake--real wheel | 1 | 2 | 3 | N |
| 9) Adjust parking brake--transmission | 1 | 2 | 3 | N |
| c. Brake overhaul area | | | | |
| 1) Recondition drums (turn drums) | 1 | 2 | 3 | N |
| 2) Recondition drums (grind drums) | 1 | 2 | 3 | N |
| 3) Remove and replace linings | 1 | 2 | 3 | N |

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

| | | |
|---|---|---|
| 4) Grind shoes to fit drums | 1 2 3 N | |
| d. Hydraulic reconditioning area | | |
| 1) Remove, clean and inspect wheel cylinders | 1 2 3 N | |
| 2) Rebuild wheel cylinders | 1 2 3 N | |
| 3) Remove, clean and inspect master cylinders | 1 2 3 N | |
| 4) Rebuild master cylinders | 1 2 3 N | |
| 5) Reassemble brake components and mount on vehicle | 1 2 3 N | |
| 6) Flush and refill hydraulic system | 1 2 3 N | |
| 7) Major brake adjustment | 1 2 3 N | |
| e. Entire brake system area | | |
| 1) Road test | 1 2 3 N | |
| 2) Dynamometer test | 1 2 3 N | |
| f. Service brake power area | | |
| 1) Disassemble, replace seals and reassemble power unit | 1 2 3 N | |
| 2) Replace entire unit with rebuilt kit | 1 2 3 N | |
| g. Stalls for brake service and brake booster systems | | |
| 1) Number of stalls needed | | _____ |
| 2) Area of each stall | | _____ |
| 3) Parking arrangement | | |
| a) 90° from aisle | Yes | No |
| b) 60° from aisle | Yes | No |
| c) 45° from aisle | Yes | No |
| d) Individual door aisle | Yes | No |
| 4) Minimum space for stalls for brake service | | |
| a) 90° from aisle | | ____ X ____ |
| b) 60° from aisle | | ____ X ____ |
| c) 45° from aisle | | ____ X ____ |
| d) Individual door aisle | | ____ X ____ |
| 5) Brake service aisles combined with other instructional laboratory area(s) | Yes | No |
| 6) Stall for brake tester/dynamometer | Yes | No |
| 7) Space required for brake tester and/or dynamometer | | _____ |
| 8) Storage space needed | | |
| a) Storage for laboratory brake components | | ____sq.ft. |
| b) Storage for brake components (parts room) | Yes | No |
| c) Square foot area of parts room shelf space | | ____sq.ft. |
| 9) Relationship to other areas of the laboratory | | |

_____
_____
_____
_____

4. Spatial relationships desired

a. Areas within the brake and power systems laboratory areas (e.g., brake service area adjacent to shoe grinder area)
1) _____
2) _____
3) _____
4) _____

b. Brake and power systems laboratory areas to other building areas (e.g., brake and power systems laboratory adjacent to delivery areas)
1) _____
2) _____
3) _____
4) _____

5. Equipment

a. Brake drum reconditioning
1) Complete brake shop — P A NA
2) Brake drum lathe — P A NA
3) Brake drum grinder — P A NA
4) Number of units required — _____

b. Brake shoe reconditioning
1) On-the-car shoe grinder — P A NA
2) Off-the-car shoe grinder — P A NA
3) Cam shoe grinder — P A NA
4) Brake shoe riviting machine — P A NA
5) Brake shoe bonding machine — P A NA
6) Number of brake shoe grinders required — _____
7) Number of brake lining installing machines required — _____

c. Benches for brake service and brake booster service needed
1) Wall-hung-benches — P A NA
2) Standard--free-standing benches — P A NA
3) Benches with storage cabinets attached — P A NA
4) Number of benches required — _____

d. Brake testing equipment
1) Dynamometer — P A NA
2) Drive over tester — P A NA
3) Other (specify) _____ — _____
4) Area needed for brake tester — ____sq.ft.

e. Relationship of equipment area(s) to other area(s) in laboratory
1) Relationship to alignment area(s)
_____
_____
_____

2) Relationship to general service area(s)
_____
_____

3) Relationship of brake service stalls to brake shop and brake service bench area(s)

6. Environmental factors

a. Aesthetic. Factors to be considered in the aesthetic domain are colors, light, style of architecture, design and the like. Indicate any special aesthetic considerations important to the planning of the brake and power systems laboratory area.

b. Aerial. Factors to be considered in this category include air temperature, radiant temperature, relative humidity, and ventilation. Indicate any special considerations important to the planning of the brake and powers systems laboratory area.

c. Visual. A properly controlled and balanced visual environment is important. The visual environment affects such things as accuracy in perception, attention to tasks, and speed of performance. Indicate any special factors which should be taken into account in planning the visual environment of the brake and power systems laboratory area.

d. Sonic. Factors to be considered in this category include such things as acoustical requirements and sound systems. Indicate any special considerations important to the planning of the brake and power systems laboratory area.

e. Safety. In planning a school building safety for students and instructors is of prime concern. Indicate any special safety considerations which have implications for design of the brake and power systems laboratory area.

7. Vertical instructional surfaces

| | |
|---|---|
| a. Chalkboard | Yes No |
| 1) Wall-mounted | P A NA |
| Number of lineal feet | _____ |
| 2) Portable | P A NA |
| a) Number of lineal feet | _____ |
| b) Provision for storage | Yes No |
| b. Tack board | Yes No |
| Number of lineal feet | _____ |
| c. Pegboard | Yes No |
| Number of lineal feet | _____ |

8. Special utilities needed (describe)

a. Electricity

_____
_____
_____

b. Water

_____
_____
_____

c. Gas

_____
_____
_____

d. Compressed air

_____
_____
_____

e. Other (specify)

_____
_____
_____

9. Minimum floor areas in square feet (optional)

a. Floor area in square feet desired for the entire brake and power systems laboratory area(s) ____sq.ft.

b. If distinct space divisions within the brake and power systems laboratory area are desired according to function, give minimum floor areas for the various areas within the total laboratory area.

1) _____ ____sq.ft.
2) _____ ____sq.ft.
3) _____ ____sq.ft.
4) _____ ____sq.ft.

10. Other important factors to be considered in the planning of the brake and power systems laboratory area(s) are:

_____
_____

FORM K

## DESCRIPTION OF DRIVE LINE AND TRANSMISSION LABORATORY AREA(S) TO BE USED PRINCIPALLY FOR ACTION LEARNING

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. The drive line and transmission laboratory area(s) should be planned:

| | | |
|---|---|---|
| a. As an independent unit(s) | Yes | No |
| b. As a combination with other unit(s) | Yes | No |
| c. As a part of a complete automotive service laboratory | Yes | No |
| d. As two separate laboratories (transmission and/or drive line) | Yes | No |
| e. In combination with lecture/demonstration laboratory area(s) | Yes | No |
| f. As an area within a single multi-use area | Yes | No |

2. Student capacity required for scheduled activities (see Form E) _____

3. Student and instructor activities, physical arrangements, equipment, and space divisions within the drive line and transmission area(s). Indicate the extent to which each of the following will occur.

| | | | | |
|---|---|---|---|---|
| a. Transmission--standard | | | | |
| 1) Remove standard transmission from vehicle | 1 | 2 | 3 | N |
| 2) Rebuild transmission | 1 | 2 | 3 | N |
| 3) Rebuild standard clutch | 1 | 2 | 3 | N |
| 4) Install standard transmission | 1 | 2 | 3 | N |
| 5) Simulate above operations on laboratory units | 1 | 2 | 3 | N |
| b. Transmissions--automatic | | | | |
| 1) Remove automatic transmission from vehicle | 1 | 2 | 3 | N |
| 2) Rebuild automatic transmission | 1 | 2 | 3 | N |
| 3) Install automatic transmission | 1 | 2 | 3 | N |
| 4) Remove transmission, install new seals | 1 | 2 | 3 | N |
| 5) Adjust linkage on automatic transmission | 1 | 2 | 3 | N |
| 6) Perform any or all of the operations on automatic transmissions in a special laboratory on laboratory models | 1 | 2 | 3 | N |
| c. Automatic transmission--dynamometer | | | | |
| 1) Install automatic transmission on transmission dynamometer | 1 | 2 | 3 | N |
| 2) Check performance of automatic transmission dynamometer | 1 | 2 | 3 | N |

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

d. Drive line
1) Remove drive shaft from vehicle — 1 2 3 N
2) Rebuild universal joints on drive shaft — 1 2 3 N
3) Install drive shaft on vehicle — 1 2 3 N

e. Rear axle
1) Remove rear axle from vehicle — 1 2 3 N
2) Rebuild and/or repair rear axle — 1 2 3 N
3) Install rear axle in vehicle — 1 2 3 N

f. Stalls needed for drive line service
1) Number of stalls needed _____
2) Area of each stall _____
3) Parking arrangement
a) 90° from aisle — Yes No
b) 60° from aisle — Yes No
c) 45° from aisle — Yes No
d) Individual door aisle — Yes No
4) Minimum space needed for drive line service
a) 90° from aisle ____ X ____
b) 60° from aisle ____ X ____
c) 45° from aisle ____ X ____
d) Individual door aisle ____ X ____
5) Drive line service aisle(s) combined with other instructional area(s) — Yes No
6) Indicate combination of area(s)
_____
_____
7) Storage space needed for "mock-up" unit(s) — Yes No
8) Indicate total storage space needed ____ X ____

4. Spatial relationships desired

a. Areas within the drive line and transmission laboratory areas (e.g., parking stall area adjacent to drive line area)
1) _____
2) _____
3) _____
4) _____

b. Drive line and transmission laboratory areas to other building areas (e.g., drive line and transmission laboratory adjacent to delivery area)
1) _____
2) _____
3) _____

5. Environmental factors

a. Aesthetic. Factors to be considered in the aesthetic domain are colors, light, style of architecture, design and the like. Indicate any special aesthetic considerations important to the planning of the drive line and transmission laboratory area.

b. Aerial. Factors to be considered in this category include air temperature, radiant temperature, relative humidity, and ventilation. Indicate any special considerations important to the planning of the drive line and transmission laboratory area.

c. Visual. A properly controlled and balanced visual environment is important. The visual environment affects such things as accuracy in perception, attention to tasks, and speed of performance. Indicate any special factors which should be taken into account in planning the visual environment of drive line and transmission laboratory area.

d. Sonic. Factors to be considered in this category include such things as acoustical requirements and sound systems. Indicate any special considerations important to the planning of the drive line and transmission laboratory area.

e. Safety. In planning a school building safety for students and instructors is of prime concern. Indicate any special safety considerations which have implications for design of the drive line and transmission laboratory area.

7. Vertical instructional surfaces

| | Yes | | No |
|---|---|---|---|
| | P | A | NA |
| a. Chalkboard | | | |
| 1) Wall-mounted | | | |
| Number of lineal feet | | | |
| 2) Portable | | | |
| a) Number of lineal feet | P | A | NA |
| b) Provision for storage | Yes | | No |

b. Tack board — Yes ____ No ____
   Number of lineal feet
c. Pegboard — Yes ____ No ____
   Number of lineal feet

7. Minimum floor areas in square feet (optional)

   a. Floor area in square feet desired for this entire drive line and transmission laboratory area(s). ____

   b. If distinct space divisions are desired according to function, give minimum floor areas for the various areas within the total laboratory area.

      1) _____ ____sq.ft.
      2) _____ ____sq.ft.
      3) _____ ____sq.ft.
      4) _____ ____sq.ft.

8. Other important factors to be considered in the planning of the drive line and transmission laboratory area(s) are:

FORM L

## DESCRIPTION OF ACCESSORIES AND POWER UNITS LABORATORY AREA(S) TO BE USED PRINCIPALLY FOR ACTION LEARNING

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

1. The accessory and power unit laboratory area(s) should be planned:

| | | |
|---|---|---|
| a. As one independent unit | Yes | No |
| b. In combination with _____ laboratory area(s) (specify) | Yes | No |
| c. As a part of a complete service laboratory | Yes | No |
| d. As separate distinct units for: | | |
| 1) Cruise control | Yes | No |
| 2) Power seats | Yes | No |
| 3) Power windows | Yes | No |
| 4) Headlight controls | Yes | No |
| 5) a) Light<br>b) Position | | |
| 5) Trunk locks | Yes | No |
| 6) Wipers | Yes | No |
| 7) Mirror controls | Yes | No |
| 8) Heater and defrost controls | Yes | No |
| 9) Air conditioning | Yes | No |
| 10) Door locks | Yes | No |
| 11) Others (specify) _____ | _____ | |
| _____ | _____ | |
| _____ | _____ | |
| e. In combination with lecture/demonstration space | Yes | No |
| f. As an area within a single multi-use area | Yes | No |

2. Student capacity required for scheduled activities (see Form E) _____

3. Student and instructor activities physical arrangements, equipment needs, and space divisions within the accessory and power unit laboratory area(s).
Indicate the extent to which each of the follow following will occur.

| | |
|---|---|
| a. Air conditioning area (units out of cars, mounted on stands and driven by electric motors) | 1 2 3 N |
| b. Cruise control (units mounted on operable engines) | 1 2 3 N |
| c. Cruise control (units mounted on engine dynamometer) | 1 2 3 N |

1 major emphasis
2 some emphasis
3 slight emphasis
N no emphasis

| | | |
|---|---|---|
| d. | Other accessories--seat, window, etc. (units mounted and operable) | 1 2 3 N<br>Yes No |
| e. | Benches needed for unit overhaul<br>Number of benches needed | Yes No<br>_____ |
| f. | Stalls needed for accessory work on live vehicles | Yes No |
| | 1) Number of stalls needed | _____ |
| | 2) Parking arrangement | |
| | a) 90° from aisle | Yes No |
| | b) 60° from aisle | Yes No |
| | c) 45° from aisle | Yes No |
| | d) Individual door aisle | Yes No |
| | 3) Minimum space required for stalls | |
| | a) 90° from aisle | ____ x ____ |
| | b) 60° from aisle | ____ x ____ |
| | c) 45° from aisle | ____ x ____ |
| | d) Individual door aisle | ____ x ____ |
| | 4) Car space combined with other instructional area(s)<br>Indicate combination with _____ (specify)<br>laboratory unit(s) | Yes No |
| | 5) Storage space needed | |
| | 6) a) Storage space for laboratory units--operable | Yes No |
| | b) Indicate total storage space needed | ____sq.ft. |
| | 7) Indicate total outside parking area needed | ____sq.ft. |
| g. | Relationship to other automotive laboratory area(s) | |
| | 1) Accessibility to chassis dynamometer | Yes No |
| | 2) Accessibility to electrical area | Yes No |
| | 3) Accessibility to engine area (mounted units) | Yes No |
| h. | Equipment needed | |
| | 1) Air conditioning | |
| | a) Freon testing and charging units | Yes No |
| | b) Number of units needed | _____ |
| | 2) Benches in the work area | |
| | a) Free-standing service benches | P A NA |
| | b) Wall-hung service benches | P A NA |
| | c) Other (describe) _____ | _____ |
| | _____ | _____ |
| | 3) Relationship of bench area to accessory service stalls (describe) | |
| | _____ | |
| | _____ | |
| | _____ | |
| | 4) Relationship of bench area to other laboratory area(s) (describe) | |

_____

_____

5) Storage cabinets for extra laboratory accessory units — Yes No

Total amount of storage space needed _____

i. Electrical requirements

1) Electrical outlets to provide power to drive automotive air conditioning units mounted in laboratory — Yes No

2) Number of electrical outlets needed _____

3) Location of electrical outlets

a) _____

b) _____

c) _____

d) _____

4) Power

a) 110V--1 Phase — Yes No

b) 220V--1 Phase — Yes No

c) 220V--3 Phase — Yes No

4. Spatial relationships desired

a. Areas within the accessories and power units laboratory area(s) (e.g., parking area adjacent to bench area)

1) _____

2) _____

3) _____

4) _____

b. Laboratory areas to other building areas (e.g., accessories and power units laboratory adjacent to delivery area)

1) _____

2) _____

3) _____

4) _____

5. Environmental factors

a. Aesthetic. Factors to be considered in the aesthetic domain are colors, light, style of architecture, design and the like. Indicate any special aesthetic considerations important to the planning of the accessories and power units laboratory area.

_____

_____

_____

b. Aerial. Factors to be considered in this category include air temperature, radiant temperature, relative humidity, and ventilation. Indicate any special considerations important to the planning of the accessories and power units laboratory area.

_____

c. Visual. A properly controlled and balanced visual environment is important. The visual environment affects such things as accuracy in perception, attention to tasks, and speed of performance. Indicate any special factors which should be taken into account in planning the visual environment of the accessories and power units laboratory area.

d. Sonic. Factors to be considered in this category include such things as acoustical requirements and sound systems. Indicate any special considerations important to the planning of the accessories and power units laboratory area.

e. Safety. In planning a school building safety for students and instructors is of prime concern. Indicate any special safety considerations which have implications for design of the accessories and power units laboratory area.

6. Vertical instructional surfaces

| | | |
|---|---|---|
| a. Chalkboard | Yes | No |
| 1) Wall-mounted | P A | NA |
| Number of lineal feet | | |
| 2) Portable | P A | NA |
| a) Number of lineal feet | | |
| b) Provision for storage | Yes | No |
| b. Tack board | Yes | No |
| Number of lineal feet | | |
| c. Pegboard | Yes | No |
| Number of lineal feet | | |

7. Minimum floor areas in square feet (optional)

a. Floor area in square feet desired for this entire accessories and power units laboratory area

b. If distinct space divisions are desired according to function, give minimum floor areas for the various areas within the total laboratory area.

1) _____ ____sq.ft.
2) _____ ____sq.ft.
3) _____ ____sq.ft.
4) _____ ____sq.ft.

8. Other important factors to be considered in the planning of the accessories and power units laboratory area(s) are:

FORM M

DESCRIPTION OF OTHER PLANNING CONSIDERATIONS RELATED TO THE ENTIRE AUTOMOTIVE LABORATORY BUT NOT DIRECTLY ASSOCIATED WITH ONLY ONE PARTICULAR AREA TO BE USED FOR ACTION LEARNING

1. Tool and parts crib

| | | |
|---|---|---|
| a. | Tool crib and parts department combined in one room | Yes No |
| b. | If yes--give total size | ____sq.ft. |
| c. | If no--give size of each | |
| | 1) Tool crib | ____sq.ft. |
| | 2) Parts department | ____sq.ft. |
| d. | Location with respect to other laboratory area(s) _____ | |
| | _____ | |
| e. | Arrangement of counter | |
| | 1) Dutch door | Yes No |
| | 2) Open counter | Yes No |

2. Oil storage area--size ____sq.ft.

3. Exhaust systems

| | | |
|---|---|---|
| a. | For individual stalls | Yes No |
| b. | C.F.M. required for each stall | _____ |
| c. | Single or dual connections | _____ |
| d. | Exhaust systems for mounted engines | Yes No |
| e. | Size of connection for each engine | _____ |
| f. | C.F.M. exhausted--each outlet | _____ |
| g. | Total number of stall connections | _____ |
| h. | Total C.F.M. to be exhausted | _____ |
| i. | Total number of engine connections | _____ |
| j. | Total C.F.M. to be exhausted from engine area | _____ |
| k. | Separate exhaust system for each area above | Yes No |
| l. | Exhaust system combined into one | Yes No |
| m. | Engine dynamometer exhaust | Yes No |
| n. | General ventilation of entire laboratory area | Yes No |

4. Hoists

| | | |
|---|---|---|
| a. | Total number of hoists needed | _____ |
| b. | Type of hoists to be used | |
| | 1) Two post in-line frame contact | P A NA |
| | 2) Single post frame contact | P A NA |
| | 3) Single post wheel contact | P A NA |
| c. | Location of hoists | |
| | 1) Alignment area | P A NA |
| | 2) Brake service area | P A NA |
| | 3) Transmission area | P A NA |
| | 4) Lubrication area | P A NA |
| | 5) Other (specify) _____ | |

d. Other considerations pertaining to type of hoist or location _____
_____
_____

5. Engine and parts cleaning area

a. Location in general service area or cleaning area (specify) _____
_____
_____

b. Heat and power requirements for engine cleaning equipment

| | | |
|---|---|---|
| 1) Gas | Yes | No |
| 2) Steam | Yes | No |
| 3) Electricity--110V--1 Phase | Yes | No |
| 4) Electricity--220V--1 Phase | Yes | No |
| 5) Electricity--220V--3 Phase | Yes | No |
| 6) Shop air pressure | Yes | No |

c. Special considerations for installation of engine cleaning tank (i.e., air to impeller bearing) (specify) _____
_____
_____

d. Location of small parts cleaning equipment (specify) _____
_____
_____

e. Heat and/or power needed for small parts washer

| | | |
|---|---|---|
| 1) Shop air pressure | Yes | No |
| 2) Reduced air pressure | Yes | No |
| 3) Electricity--110--1 Phase | Yes | No |

6. Wash rack area for entire vehicle

| | | |
|---|---|---|
| a. Size of wash rack | ____sq.ft. | |
| b. High pressure cleaning equipment | Yes | No |
| c. Power required for high pressure unit | | |
| 1) Air | Yes | No |
| 2) Electricity 110V--1 Phase | Yes | No |
| 3) Other (specify) _____ | | |
| _____ | | |

7. Floor drains

| | | |
|---|---|---|
| a. Floor drains for each stall | Yes | No |
| b. Trench drain serving entire laboratory | Yes | No |
| c. Sludge and oil interceptor | Yes | No |
| d. Separate drain for alignment pit | Yes | No |

8. Lubrication equipment

a. Number of lubrication stations needed _____
b. Type of lubrication equipment

1) Overhead reels — Yes No
2) Island dispensers — Yes No
3) Other (specify) _____

c. Location of lubrication equipment (specify)
_____

d. Lubrication equipment combined with hoist equipment used for other purposes (state combination) _____

9. Service desk and customer waiting area

a. Location (specify) _____

b. Size of area required (specify) _____

10. Air compressor

a. Location (specify) _____

b. Size C.F.M. needed _____

c. Power required
1) 110V--1 Phase — Yes No
2) 220V--3 Phase — Yes No

d. Location of air outlets
1) Each bench — Yes No
2) Spark plug cleaner — Yes No
3) Parts cleaning area — Yes No
4) Air operated car wash — Yes No
5) Grease dispensing equipment — Yes No
6) Air operated hoists — Yes No
7) Other (specify) _____

e. Location of water outlets
1) Parts cleaning area — Yes No
2) General around-wall space (state spacing) _____
3) Mounted engine area — Yes No
4) Other (specify) _____

f. Gasoline storage — Yes No
Describe distribution system to engine area(s) after consultation with local fire authorities _____

11. Laboratory lighting

| | | | |
|---|---|---|---|
| a. | General illumination of laboratory area(s) area(s) foot candles _____ | | |
| b. | Portable illumination | Yes | No |
| d. | 1) Reel type drop cords | Yes | No |
| | 2) Over each stall | Yes | No |
| | 3) Over each hoist | Yes | No |
| | 4) Others (describe) _____ | | |
| | _____ | | |

12. Laboratory doors

| | | | |
|---|---|---|---|
| a. | Size 12 x 12 | Yes | No |
| b. | Size 12 x 14 | Yes | No |
| c. | Other (specify) _____ | ____ x ____ | |
| d. | Power operated | Yes | No |
| | 1) Location of power operating control buttons (state) _____ | | |
| | 2) Other (specify) _____ | | |

13. Safety

| | | | |
|---|---|---|---|
| a. | Master shut off for all air operated equipment | Yes | No |
| b. | Master shut off for all electrically operated equipment | Yes | No |
| c. | Location of master controls (state) | | |
| | _____ | | |
| | _____ | | |
| | _____ | | |
| | _____ | | |

FORM N

## ADDITIONAL PLANNING CONSIDERATIONS

Other important factors to be considered in the overall planning and design of instructional areas for the planned automotive service occupational preparation program(s) are:

# PART IV

## ANNOTATED BIBLIOGRAPHY

### GENERAL FACILITY PLANNING

American Association of School Administrators. Planning America's School Buildings. Washington, D. C.: The Association, 1960.

Contributors to this publication were teachers, supervisors, administrators, architects, engineers, school board members, and school plant planning specialists. In addition to background material on school house construction, the book deals with specific topics including school surveys, analysis and computation of space and facility needs, enrollment projections, building designs, site selection, finance, and building maintenance and operation. Many pictures and illustrations are found, along with sample forms and outlines, which can be used in the facility planning process. No special consideration is given to unique problems faced in the planning for vocational and technical education facilities.

Boles, Harold W. Step by Step to Better School Facilities. New York: Holt, Rinehart, and Winston, 1965.

A textbook on overall planning procedures for new and improved school facilities. The typical topics (school surveys, building planning, site selection and acquisition, architectural planning, contracting for construction, and the equipping and furnishing of buildings) are covered. The only mention of vocational schools is on page 270 where the author quotes from another source:

> Vocational training should be de-emphasized in the schools since this training often becomes obsolete before it can be used; also, special "trade" and "vocational" schools should be discontinued, unless the vocational curriculum is liberal in approach and broad in character. Such schools are often used as dumping grounds for students who are not wanted elsewhere and often more than custodial care is provided for them. When more is provided, the skills taught are frequently too partial in nature.

Conrad, M. J. Four Steps to New Schools. Columbus, Ohio: Educational Administration and Facilities Division of the Bureau of Educational Research and Service. The Ohio State University.

A book prepared for the inexperienced school planner. The author emphasizes that a school building is an educational tool and should be designed to do the job they are intended to do. The four steps discussed are: 1) district-wide building survey; 2) educational planning; 3) architectural planning and construction; and 4) moving in and settling down. A glossary of important terms used in plant planning is located in the back of the book.

Conrad, M. J.; Wohlers, E. E.; and Griggs, Norman. School Plant Planning: An Annotated Bibliography. Columbus, Ohio: The Administration and Facilities Unit, School of Education, The Ohio State University, 1968.

A compilation of references in the following categories: general references; periodicals; overview of school plant field; district-wide building survey; educational planning; the architect and his work; moving in and settling down; and related topics.

Finchum, R. N. Extended Use of School Facilities. Washington, D. C.: U. S. Department of Health, Education, and Welfare, 1967.

This manual is intended to assist officials of school districts who are planning programs for maximum use of school properties and who must develop policies and regulations for efficient management of such programs. Various schedules of facility use are illustrated for nine different school systems.

Green, Alan C. Educational Facilities with New Media. Washington D. C.: Department of Audiovisual Instruction, National Education Association, 1966.

This work is designed to meet the needs of three distinct groups interested in providing educational facilities. Report A: "A Guide for Policy Makers" is directed to boards, administrators, planning committees, and institutional planners. Report B: "A Guide for the Design of Professions" is designed for architects, planners, and design specialists and planning committees; and Report C: "A Technical Guide" is intended for design-architects, engineers, equipment and furniture suppliers, and media specialists.

National Council on School House Construction. NCSC Guide for Planning Plants. East Lansing, Michigan: The Council, 1964.

A basic reference on school plant planning and construction for use by superintendents, school board members, school plant planners, state department of education personnel, local school system officials, collegiate institutions, architects, lay advisory groups, and graduate students. Major topics covered

are: planning and programming educational plants; spaces and equipment for learning; non-instructional systems; space organization and economy and resources. Much attention is given to plant planning through a description of a survey technique used to determine and satisfy school plant needs for a community. Site selection, kinds of instructional spaces, sonic, termal, and visual environments, and best use of natural and plant resources are also treated.

North Carolina. Department of Public Instruction. A Digest of Educational Planning. Raleigh.

The contents of this book include a description of what educational planning is, when it is done, who does it, and how it is done. The three steps of planning are identified as 1) identification and analysis of educational and facility needs, 2) adapting and implementing plant improvement programs, and 3) completing and evaluating a process of the educational planning.

North Carolina. Department of Public Instruction. The Division of School Planning. School Design. Raleigh.

Basic principles of school design is the thrust of this publication. It focuses on the interrelationship of patterns of school activities, organizatien of activities on the site, design potentials for various sites, and the building design data necessary for communicating the school's needs to the architect.

School Planning Laboratory. Spectrum of Electronic Teaching Aids in Education. Stanford, California: Stanford University, 1965.

This publication seeks to suggest which learning functions can be served electronically, to symbolize the nature and progressive complexity of each electronic system, and finally to estimate budgets which will provide for adequate systems in relation to engineering and warranty costs.

Strevell, Wallace H., and Burke, Arvid J. Administration of the School Building Program. New York: McGraw-Hill Book Company, Inc., 1959.

A comprehensive textbook on the administration of the school plant program. The book is organized into three major parts: Part I - "Policy Decisions" deals with school building needs, studies and long-range planning; Part 2 - "Program Recommendations" deals with local study of plant needs, evaluation of existing plant, determination of additional plant needs, site selection and development, and the preparation of educational specifications. Part 3 - "Project Administration" is concerned with the financial aspects of a building program and with public relations. There is a brief mention of the objectives of vocational education as contrasted with the objectives of general education on page 12.

The Cost of a Schoolhouse. New York: Educational Facilities Laboratories, 1960.

This book deals with the cost of a schoolhouse and the process of planning and financing it. It provides median costs for various building elements, designates individual responsibilities in process of building, and discusses arrangement of space and environmental factors.

## VOCATIONAL-TECHNICAL FACILITY PLANNING

American Vocational Association. Developing Educational Specifications for Vocational and Practical Arts Facilities. Washington, D. C.: The Association.

The purpose of this publication is to reduce the broad principles and processes of school plant planning to those most applicable to vocational and practical arts education. Effective techniques for developing educational specifications are suggested. The committee provides a sequential treatment of program and administrative considerations, desired space and education program, special site arrangement features, special physical aspects of building, and the financial requirements for the project.

Calder, Clarence R. Modern Media for Vocational-Technical Education. Connecticut: State Department of Education, 1967.

A study of related literature on programmed instruction, instructional films, instructional television, and learning from various instructional media. It analyzes new instructional media approaches used at North Carolina's Fundamental Learning Laboratories System, and the integrated experience approach at Oakland Community College.

Chase, William W., Browne; Johnny W.; and Russo, Michael. Basic Planning Guide for Vocational and Technical Education Facilities. Washington, D. C.: Department of Health, Education, and Welfare, U. S. Government Printing Office, 1965.

A general guide that describes important steps to be followed in the planning for and construction of vocational and technical education facilities. Important topics covered are: the impact of the Vocational Education Act of 1963; surveys of area educational needs; use of consultant services; basic planning considerations; educational specifications; general planning; and school construction cost and outlay. Sample floor plans and picture illustrations of vocational schools are included.

McKee, Robert L., and Ripley, Katherine J. The Documentation of Steps to Establish a Technical College and the Evaluation of PERT as a Planning Tool for Educators. Bailey's Crossroads, Virginia: Unpublished report, 1966.

An account of the procedures followed in the establishment of a technical college within a period of less than 90 days. The entire planning process and implementation is described along with the PERT technique which was applied. The author concluded the PERT (Program Evaluation and Review Technique) was effective in assisting the planners in reaching their objectives within a short period of time.

Stanford University. Trends in Facility Design-Vocational-Technical Continuing Information Program. Stanford, California: School of Education, 1966.

The pamphlet emphasizes the need for a total flexibility concept in school building. Consideration is given to the use of building components to provide flexibility in space, lighting, air-conditioning, sewage system, and the like.

U. S. Department of Health, Education, and Welfare. New Ideas and Construction for Vocational Education. Washington, D. C.: Unpublished, 1967.

A report on new trends in the construction of vocational education facilities. Among topics covered are occupational clusters, teaching techniques such as micro-teaching and educational television, facilities for handicapped children, educational parks, and unique problems faced by large city school systems. Special consideration is given to maximum utilization of vocational education facilities on an around-the-clock basis.

Valentine, Ivan E., and Conrad, M. J. Progress Report: Vocational-Technical Facilities Project. Columbus, Ohio: The Center for Vocational and Technical Education, The Ohio State University, 1967.

A report which relates the thinking of six outstanding consultants on various topics relating current trends in vocational-technical education and facility planning. Review the work of a local consortium consisting of three Center vocational specialists, three school plant planners, three representatives from the State Department of Education, three local school officials, and three practicing architects in defining problems, clarifying issues, suggesting approaches to organizing planning guides, and establishing guidelines for a series of facility planning guides in selected vocational and technical subject areas.

Wohlers, A. E. A Manual for Planning a Secondary School Building (Vocational Education). Columbus, Ohio: The Administration and Facilities Unit, School of Education, The Ohio State University, Pamphlet C-14.

A general facility planning guide for programs of vocational education. Principal topics covered include: 1) number of teaching stations; 2) types of teaching stations; 3) equipment needs; and 4) floor areas required. The planning manual also deals with spatial relationships of teaching facilities and utilization of auxiliary areas such as libraries,

cafeterias, and administrative suites. Planners using the guide are directed to complete checklists and fill-in blanks with the necessary information pertinent to vocational facility planning.

## AUTOMOTIVE SERVICE FACILITIES PLANNING

Automobile Manufacturers Association. Standards for Post High School Automotive Programs. 320 New Center Building, Detroit, Michigan: Unpublished 1968.

A general guide for post secondary programs. This guide was developed by the joint Automobile Manufacturers Association-American Vocational Association Industry Planning Council, and will be available for distrubution in December, 1968.

Automobile Manufacturers Association. Standards for Automotive Service Instruction in Secondary Schools. Detroit, Michigan: Automobile Manufacturers Association, 1965.

A guide book planned to be used by people planning programs and facilities for High School Programs. Much information is available, however, which does apply to Post High School Programs (i.e., charts showing suggested laboratory layouts).

Automotive Service Industries Association. Check List of Tools and Equipment for Automotive Programs. Chicago, Illinois: The Association, 1965.

School Shop. Modern School Shop Planning. Prakken Publications, Incorporated, Ann Arbor, Michigan: Fifth Edition, Revised, 1967.

A publication compiled over a period of years, and based upon actual school shop planning conducted throughout the country. The publication covers many industrial areas--is not confined to any one area.

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